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The Relation of Hyperactivity to Parenting Stress within the Parent-Child Relationship in Children with Autism Spectrum Disorders

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The Relation of Hyperactivity to Parenting Stress within the Parent-Child Relationship in Children with Autism Spectrum Disorders

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Abstract

Research indicates that parents of children with autism spectrum disorder (ASD) experience more total stress and more stress within specific domains of the parent-child relationship. Specific externalizing behaviors such as hyperactivity have been related to elevated adverse parent-child outcomes in families with typically developing children. To date, the relation of child hyperactivity to parenting stress has not been examined in children with ASD. This study investigated the extent to which child hyperactivity differs between children who are typically developing (TD) and children with ASD. In addition, this study also examined the relation of child hyperactivity to parenting stress. Participants included 39 typically developing children and 25 children with ASD (68.8% male; 74.3% Caucasian) between the ages of three years and six years eleven months (*M age* = 56.44 months, *SD* = 13.64 months). Parent and teacher reports were used to evaluate children's hyperactivity and parent reports were used to determine parenting stress levels. Parents of children with ASD had significantly greater reported overall stress, $\Delta R^2 = .22$, $B = .58$, $p = .000$, in addition to greater stress on each subscale separately: parent distress, $\Delta R^2 = .18$, $B = .51$, $p = .000$; parent-child dysfunctional interaction, $\Delta R^2 = .19$, $B = .53$, $p = .000$; and difficult child, $\Delta R^2 = .22$, $B = .57$, $p = .000$. Children with ASD also had significantly greater teacher reported hyperactivity, $\Delta R^2 = .05$, $B = .28$, $p = .041$ and parent reported hyperactivity, $\Delta R^2 = .24$, $B = .60$, $p = .000$. Parent reported hyperactivity significantly predicted total parenting, stress, $\Delta R^2 = .14$, $B = .53$, $p = .000$, and each subscale separately: parent distress, $\Delta R^2 = .07$, $B = .37$ $p = .018$; parent-child dysfunctional interaction, $\Delta R^2 = .13$, $B = .52$, $p = .000$; and difficult child, $\Delta R^2 = .22$, $B = .67$, $p = .000$. Hyperactivity did not significantly moderate the relation between diagnostic status and parenting stress for either teacher or parent report. However, it was found that increased hyperactivity within both the TD and ASD groups was associated with significant increases in total parenting stress, difficulties within the parent-child interaction and difficulties associated with the child. Post-hoc analysis revealed that parent reported hyperactivity mediated the relation between diagnostic status and parenting stress, providing further insight into the mechanisms by which diagnostic status may convey vulnerability for parenting stress. Collectively, these findings suggest hyperactivity is a vulnerability factor for children and parents across diagnosis and represents a valuable point of intervention.

Keywords: autism spectrum disorder; neurodevelopmental disorders; externalizing behaviors; hyperactivity; parenting stress

CHAPTER I

Introduction and Literature Review

Previous research has demonstrated the challenges and demands of raising a child with an autism spectrum disorder (ASD) (i.e. Baker et al., 2002; Estes et al., 2009; Estes et al., 2013). Individuals diagnosed with ASD have significant impairment in two core areas of functioning: (1) social and communicative development and (2) fixed or repetitive behaviors (5th ed., *Diagnostic and statistical manual of mental disorders;* American Psychiatric Association, 2013). Parents of children diagnosed with ASD frequently experience more stress than parents of children who are typically developing (Baker, Blacher, Crnic, & Edelbrock, 2002; McKinney & Peterson, 1987) and parents of children with other developmental disabilities (Holroyd & McArthur, 1987). Stress is a reaction to a stimulus, event, or person that disturbs the equilibrium of an individual's physical and mental health (Cannon, 1935; Dougall, Hyman, Hayward, McFeeley, & Baum, 2001; Skinner, 1985) and thus, parenting stress is the affective response to the sometimes overwhelming demands of parenting. A better understanding of factors related to the elevated stress experienced by these parents is important because stress has been linked to more negative health outcomes such as depression and a decrease in marital satisfaction for parents, as well as difficulties for children, such as in developing secure bonds with caregivers (Dunn, Burbine, Bowers, & Tantleff-Dunn, 2001; Hartley, Baker, Seltzer, Greenberg, & Floyd, 2011; Van IJzendoorn, Goldberg, Kroonenberg, & Frenkl, 1992). Given the importance of the parent-child relationship and research documenting the extensive demands associated with having a child with ASD, research is needed on child characteristics that may exacerbate parenting stress for parents of children with ASD.

The presence of externalizing behaviors predicts elevated stress levels in parents of children with ASD (Donenberg & Baker, 1993). Externalizing behavior is an all-encompassing

term referring to a variety of problem behaviors (Donenberg et al., 1993; Liu, 2004). Children with ASD frequently exhibit elevated rates of externalizing behavior problems beyond what can be explained by symptoms associated with their diagnosis (Kim, Szatmari, Bryson, Streiner, & Wilson, 2000; Moricke, Swinkel, Beuker, & Buitelaar, 2010). However, only limited research has examined the presence of specific externalizing behavior problems such as hyperactivity in children with ASD and the effect these additional behavior problems have on parents' perceived stress within the parent-child relationship. Because we know children with ASD commonly exhibit externalizing behavior problems, understanding the impact of these problems on parental stress would deepen our understanding of the challenges encountered within the parent-child relationship (Kim et al., 2000; Moricke et al., 2010). This knowledge should aid the development of better interventions to support these families.

The current study investigates how the presence of a specific externalizing behavior, hyperactivity, affects the amount of stress experienced by parents with young children (ages 3:0 to 6:11) with and without ASD. Hyperactivity is characterized by challenges in two unique areas: excessive motor activity and/or difficulty in sustaining attention (Lui, 2004). Hyperactivity has long been associated with increased risk of poorer outcomes later in life for typically developing children, in addition to the amplified stress parents experienced when raising a child with these behaviors (Lilienfeld & Waldman, 1990; Morgan, Robinson, & Aldridge, 2002; Webster-Stratton & Hammond, 1997). However, there is a lack of research examining the relations between child hyperactivity and parenting stress in young children with ASD. This study attempted to understand the relations between ASD, hyperactivity, and parenting stress in an effort to enhance family functioning and inform future interventions for families of children with these associated behavioral challenges. The following sections provide an overview of ASD,

followed by definitions of the constructs of parenting stress, externalizing behavior, and hyperactivity, along with reviews of the theoretical and empirical literature pertinent for the current study.

Autism Spectrum Disorders

Overview

Autism spectrum disorder (ASD) is an umbrella term that represents a spectrum of pervasive neurodevelopmental impairments in two core areas: (1) deficits in social skills and communication, and (2) fix interests and repetitive stereotyped behaviors (5th ed., *Diagnostic and Statistical Manual of Mental Disorders [DSM];* American Psychiatric Association [APA], 2013). This disorder generally manifests within the first three years of life and persists throughout the lifespan (Bishop & Lord, 2006). The previous classification of ASD is consistent with the *DSM-IV-TR* category of Pervasive Developmental Disorders (PDD) which included autistic disorder, Asperger's disorder, childhood disintegrative disorder, Rett's disorder, and pervasive developmental disorder-not otherwise specified (PDD-NOS). However, distinguishing between these subtypes within *DSM-IV-TR* was rather challenging due to the heterogeneity of ASD and lead to differing diagnoses between diagnostic centers (Lord, Luyster, Guthrie, & Pickles, 2012). Therefore within the *DSM-5*, one single term, autism spectrum disorder is used to classify the deficits in these two core areas. In addition, within the spectrum, further differentiation by IQ can range from high functioning (normal to superior range IQ) to low functioning individuals, representing a broad range in symptoms, severity and developmental trajectories (Munson, Faja, Meltzoff, Abbott, & Dawson, 2008).

Differential Diagnoses

Whereas all individuals diagnosed with ASD have significant impairment in two core

areas of functioning, social and communicative development and fixed or repetitive behaviors, the onset, severity, and symptom levels can vary across diagnoses. Therefore, the current study focused only on higher functioning children with the original PDD diagnosis of: autistic disorder, Asperger's disorder, and PDD-NOS as specified in *DSM-IV-TR*. Consequently, only the three aforementioned disorders are discussed in detail.

Autistic disorder. Autistic disorder, also referred to as "autism," is characterized by (a) qualitative impairment in one's ability to interact socially, which may manifest as a lack of nonverbal behaviors, the failure to create relationships with peers, an absence of the desire to share interests or enjoyment or a deficiency in emotional reciprocity; (b) impairment in communication, which may appear as a delay or inability to develop language skills, the use of repetitive, stereotyped, echolalic verbiage or the lack of make-believe play; and (c) having stereotyped patterns of behaviors, activities, and interests that are considered repetitive, which can include inflexibility, preoccupation with parts on an object, or hand flapping behavior. The level of severity of symptoms falls on a continuum. Individuals with autism are generally considered high, low, or moderately functioning with regards to IQ and symptom severity (4th ed., text rev.; *DSM-IV-TR;* APA, 2000).

Asperger's disorder. Asperger's disorder is commonly considered to be "higher-functioning autism," as these children do not have significant language or cognitive delays. Similar to that of autistic disorder, Asperger's disorder is marked by deficits in social interaction, as well as restricted repetitive stereotyped patterns of behavior, activities, and interests. These children generally have a desire for social interaction but lack the necessary skills to successfully interact and develop age appropriate relationships. They often have trouble utilizing conventional social rules and nonverbal cues as they typically have trouble changing personal rituals or

routines (4th ed., text rev.; *DSM-IV-TR;* APA, 2000).

Pervasive developmental disorder – not otherwise specified. PDD–NOS is a diagnosis used when children demonstrate severe and significant impairments in verbal and nonverbal communication skills and social interactions, or have persistent patterns of behaviors or interests, but do not meet all of the diagnostic criteria of another pervasive developmental disorder. This diagnostic category includes "atypical autism" which consists of instances when children demonstrate atypical symptomatology, sub-threshold symptomatology, or present with symptoms later than the typically age of onset (4th ed., text rev.; *DSM-IV-TR;* APA 2000).

Epidemiology

According to the U.S. Centers for Disease Control and Prevention (CDC, 2013), the prevalence rates of ASD have risen dramatically in recent decades, nearly doubling in the last five years with current estimates of 2%, or approximately 1 in every 50 births with a male to female ratio of 4:1. The most recent analysis compared diagnoses in 2007 with estimates of 1 in every 86 births to those in 2011-2012. Epidemiologists suggest that diagnostic changes, more widely used and improved diagnostic tools, and more education in the field have influenced this rise (Russell, 2012). In effect, researchers widely attribute the recent drastic increase in prevalence to a rise in diagnoses of children who previously had unrecognizable autism spectrum disorder, compared to an actual increase in children with the disorder (Russell, 2012).

Etiology

The etiology of ASD is complex, with researchers suggesting multiple factors are likely involved including a genetic and biological predisposition that is influenced by environmental factors (Bishop & Lord, 2006; Russell, 2012; Wang et al., 2009). The hereditability of ASD, although well-established within the literature, reveals reports of diverse beliefs of the genes

responsible for its prognosis (Freitag, 2007). Heritability in ASD is shown to be the highest in twin studies with rates over 90% (Freitag, 2007; Hallmayer et al., 2011). Although we know there is strong evidence for a genetic component for ASD, many researchers believe that the contribution of environmental factors has been underestimated (Hallmayer et al., 2011; Wang et al. 2009). Previous researchers using structural brain imaging had believed that ASD was strictly a disorder that originated within the brain and was determined by genetics (Minshew & Williams, 2007). However, new research suggests that genetics alone does not account for all of ASD diagnoses. Researchers have found that toxins within the environment, such as chemicals thalidomide and valproic acid, increase the risk of autism during prenatal exposure (Miyazaki, Narita, & Narita, 2005). Other studies have found additional prenatal risk factors, such as older age or presence of diabetes in either the mother or father during conception, use of psychiatric drugs by the mother while pregnant, and low birth weight of the child at delivery show increased risk of autism (Arndt, Stodgell, & Rodier, 2005; Gardener, Spiegelman, Buka, 2009). Although researchers suggest many possible causes, it seems clear that interactions between genes and experiences are involved in most cases of ASD. Early intervention and support from family members has been linked to higher IQ, increased communication skills, and greater adaptive behavior (Virués-Ortega, 2010). The following section will present research on the role of the caregiver in child development and its link to children with ASD.

The Role of the Parent in Child Development

Theoretical Background

The important role of the caregiver and the social environment in early child development has been well established within the field of developmental psychology by many theorists and researchers. Bronfenbrenner (1979/1998) was particularly influential in suggesting

that children learn about the world and the self through their early experiences with their caregivers. In addition, Belsky (1984) focused on the factors that adversely affect parenting behavior and, in turn influence child development. Abidin (1992) developed this idea further by proposing that parenting behaviors are multidimensional and are influenced by a variety of developmental, environmental and psychological factors. The following sections briefly review the developmental theories of Bronfenbrenner, Belsky, and Abidin.

Bioecological theory of developmental processes. Bronfenbrenner's bioecological theory of developmental processes described development as changes that occur through the interactions between persons and their environment (Bronfenbrenner, 1979). Bronfenbrenner's (1979) groundbreaking work combined two distinct fields, sociology and developmental psychology to place child development within an ecological perspective. According to Bronfenbrenner, the ecology of development consists of four interlocking nested social systems that shape individual growth. The first system, the *microsystem*, encompasses the groups, organizations, and activities that the child has most immediate and direct contact with including: parents, siblings, religious institutions, teachers, neighborhood, and peers. The second system, the *mesosystem* refers to the relations between the child's microsystems, such as the family-peer experiences and the parent-teacher relationship. The third system, the *exosystem* reflects the broader social context in which the child does not have immediate or direct contact including: parent's work experiences, or the decisions made on the school board. Things within this system influence the child indirectly. Lastly the fourth system, the *macrosystem* encompasses the cultural uniformities, such as public policies, that occur across the lower-order systems in addition to the ideologies that underlie these consistencies. The *macrosystem* provides the broad ideological and organizational patterns that influence the how lower-order systems interact with

one another, and thus evolve over time through economic recession, war, or technological changes.

Bronfenbrenner further developed his original theory by adding the *chronosystem, which* refers to how individuals and their environment change over time. He thus proposed the Process-Person-Context-Time (PPCT) model that emphasized more heavily the role of the person, such as biology and psychology and the processes involved (Bronfenbrenner & Morris, 1998). This model includes four concepts and their interactions together: The *process* component includes the reciprocal interactions, typically active, and regular between a child and his or her direct environment, which includes symbols, objects, and people. Within the *process* component are *proximal processes,* which are the developmental interactions between a person and his or her environment, such as group and solitary activities.

In addition to the process component, Bronfenbrenner (1979) noted the characteristics of the person, context, and time are influential in determining the strength of the proximal processes. First, the role of *person* characteristics in social interactions consists of three personal characteristics: (a) *demand* characteristics such as age, gender, or physical appearance that influence how the social environment responds; (b) *resource* characteristics such as past experiences, knowledge, and skills, which are not immediately recognizable but are necessary at various developmental stages for effective proximal processes to occur; and (c) *temperamental* characteristics such as variations in motivation and persistence aid in determining early interaction styles of the child and help to maintain these over time. The *context* involves the five nested systems (*microsystem, mesosystem, exosystem, macrosystem, and chronosystem)* described in Bronfenbrenner's (1979) original theory. Finally, *Time* is especially important in this developmental model, encompassing three levels: *micro, meso,* and *macro. Micro-time*

refers to the immediacy of what is occurring during incidences of proximal processes. *Meso-time* refers to the frequency, either over days, weeks, months, or years, of when the processes occur in the individual's environment. *Macro-time*, also referred to as the *chronosystem*, includes the endurance of proximal processes over time as well as changes within the larger society across generations. For example, marriage, divorce, and the birth of a new baby are all major experiences within an individual's lifetime.

In conclusion, Bronfenbrenner's bioecological system theory highlights the importance of understanding the theory of human development. Specifically, he underlines how proximal processes or interactions with the environment shape children's development. In addition, he discusses how different levels of various environments, beginning with social and cultural environments essentially influence development. However, the efficacy of these interactions is largely influenced by the context, period, characteristics of the child and their environment. Bronfenbrenner's theory has many implications for the interactions, or proximal processes, between parents and their children with ASD. These interactions are thought to play a significant role in children's development although other factors, such as children's unique characteristics as well as those associated with the disorder, are also influential.

Process model of the determinants of parenting. Belsky's (1984) model of the determinants of parenting explains competent parental functioning by recognizing factors that help or hinder parents' performance in the parental role. The model focuses on the factors that influence parental behavior, which then impact child-rearing, and finally affect overall child development. Similar to Bronfenbrenner's bioecological theory of developmental processes, Belsky's theory applies to processes at the micro level including interactions between the parents and children.

Belsky noted that parenting is influenced by three domains: (a) the personal psychological properties of parents; (b) the characteristics of the child; and (c) broader social contexts such as marital relations, social networks, and job-related experiences that contribute to the overall psychological wellbeing of the parent (Belsky, 1984). Based on his review of prior research, Belsky (1984) made the following conclusions regarding the determinants of parenting: (a) The characteristics of the parent, of the child, and of the broader social contexts work together to influence parenting; (b) Each of these three determinants uniquely contribute to parenting by supporting or impairing it; and (c) Both the developmental history and the personality of the parent indirectly shape parenting behaviors through the influence of the marital relationship, the occupation, and other broad contexts within the parent-child relationship.

Lastly, Belsky concluded that the personality and psychological wellbeing of the parent were the most influential factors in supporting positive parental functioning (Belsky, 1984). Although Belsky (1984) does not explicitly address parenting stress or general stress, his model could be seen as including parenting stress under one of his three determinants of parenting because he discusses the importance of parental psychological well-being. The principle underlying Belsky's theory is that parenting stress is an internal construct, influenced by a variety of factors that impact the external outcome of parenting. Based on his theory, it is conceivable that the stress parents of children with ASD generally experience is directly influenced by the unique characteristics of each child and his/her disorder. However, the influence and the dynamics of this stress will likely be shaped by several factors, such as the marital relationship, parenting skill, or the severity of the child disorder, which can enhance or hinder the interactions between the parent and child.

Theory of parental stress. Abidin first proposed his theory of parenting behaviors in 1976 when he developed a theoretical model of the determinants of dysfunctional parenting (as citied in Abidin, 1995). Although it is the oldest theory of parental stress in the general literature, it is still the most dominant theory. Abidin (1992) initially proposed that numerous environmental, psychological, and developmental elements influence the behavior of parents, including parenting stress. In this theory, parenting stress is hypothesized to negatively affect parenting behavior, which then affects child outcomes (Abidin, 1992). Further, a central focus of Abidin's theory involves factors that contribute to parenting stress.

Abidin proposes that three major domains contribute to parenting stress: parent characteristics, child characteristics, and situational/demographic life stress. These three domains were used to create what has become the leading measure of parenting stress, The Parenting Stress Index (PSI: 1995/2012). Parent characteristics are sources of stress unique to the parent that can interfere with the parent-child relationship, including parents': (a) sense of inadequacy as a parent, (b) attachment relations with their child, (c) social isolation, (d) role restriction, and (e) psychological and physical well-being. Child characteristics are unique qualities of the child that potentially make parenting more challenging and therefore induce stress within the parent. These include factors such as child hyperactivity/distractibility, demandingness, adaptability, acceptability, and mood. Lastly, the third domain, situational/demographic life stress, refers to the stress parents experience independent of the parent-child relationship. These can include the marital relationship, parental health, social support/isolation, role restriction, job loss, and socioeconomic status. These external situational variables can influence the magnitude of parenting stress without directly causing or affecting it.

Relations between theoretical parenting models. Abidin and Belsky's theories both delineate specific elements that influence parenting and parenting stress but each focuses on distinctive aspects of integration between the person and environmental factors and the parent-child interaction. Belsky's model focuses more on determining parenting, suggesting that child characteristics, parent characteristics, and external situational factors influence parenting. Abidin, on the other hand, further defines those same factors as contributors in explaining parenting stress, which he proposes can lead to dysfunctional parenting behavior. There is also one other minor difference between these two models. Belsky (1984) proposes that the same parenting practices occur in all families, whereas Abidin's (1992) focus is on dysfunctional parenting behaviors. Both of these models include parent, child, and situational elements which affect parenting practices and their connections to child outcomes however the major distinction between these two theories is Abidin's inclusion of parenting stress as an outcome of these factors.

Theoretical framework for the current study. Given that Abidin's theory (2012) most closely aligns with the goals of the current study, it provided the conceptual framework for this dissertation. Based on his theory, Abidin created the dominant measure of parenting stress, the PSI, which will be used in the current study. Although this study utilized Abidin's theory as the primary theoretical foundation, it is also influenced by the bio-ecological viewpoint as defined in Bronfenbrenner's theory. Bronfenbrenner's model enhances our understanding of the development of the parent, the child, and the family relationship by bringing in the biological nature of the parent and child in conjunction with the environmental influences. The following section provides an overview of research on stress as well as discusses the role of parental stress within the parent-child relationship and its link to children with ASD.

Stress

Overview

Stress is a reaction to a stimulus, event, or person that disturbs the equilibrium of an individuals' physical and mental health (Cannon, 1935; Dougall et al., 2001; Skinner, 1985). However the term stress has been difficult to define and there is currently no single agreed definition in existence. The term stress originally proposed by Cannon (1935) suggests that emotional and physical stimuli trigger an individual to surpass a critical level, which then disrupts their homeostasis. This general concept is still recognized today as the basic definition of stress but this definition has since been broadened to encompass various aspects of stress. Levin and Ursin (1991) specifically distinguished between the (a) stress stimuli, such as a specific event like going to the doctors, which they labeled as "Input"; (b) individual processing or how the individual perceives the stimuli; and (c) stress reaction, such as physical sensations like high blood pressure, or emotional symptoms like anxiety, which they labeled as "Output". While nearly all individuals experience stress, it becomes dangerous when it begins to interfere with one's ability to live a normal life over an extended period (Rani, 2013). Researchers have associated a variety of negative outcomes with excessive amounts of stress such as decreased attention, performance and decision making capacity; lower cognitive abilities; and loss of memory (Rani, 2013). Because we know stress can negatively impact individuals differently, it is important to understand how stress presents differently for parents, partially those with children with ASD.

Parenting Stress

Overview

Parenting is one of the most challenging responsibilities experienced in life. Parenting stress is the affective response to the sometimes overwhelming demands of parenting. Parents

generally experience this stress when their perceptions of the demands of parenting outweigh their resources to cope in a healthy manner (Deater-Deckard, 1998). Researchers suggest that parenting stress is a normative part of the parenting role (Crnic & Greenberg, 1990), but note that clinical attention is warranted once the stress is elevated to the point where it negatively impacts the parent-child relationship through maladaptive parenting behaviors (Abidin, 1992; Belsky, 1984; Morgan et al., 2002; Webster-Stratton, 1990).

Parenting stress can have a variety of negative effects, specifically in families of young children because of the important role parents play in children's development during the crucial preschool years. Physical and psychological problems among parents are commonly associated with increased parental stress (Abidin, 1995). Parents under emotional and physical stress tend to rate child behaviors as more problematic, have a lower threshold for these behaviors and then tend to react in a harsher manner than parents with less stress (Lahey, Conger, Atkeson & Treiber, 1984). Thus parents with elevated stress levels may have decreased tolerance for a variety of child behaviors (Webster-Stratton, 1990), which has been linked to inappropriate parenting behaviors and lack of responsiveness (Lahey et al., 1984), and in some instances problems in the parent-child relationship including child attachment issues (Jarvis & Creasey, 1991). Issues that arise within the parent-child relationship are intensified by raising a child with disabilities. When these parents experience high levels of parenting stress, they may become less capable of implementing interventions to help their children (Kazdin, 1995), which is particularly significant for children with a clinical diagnosis such as an autism spectrum disorder (ASD).

Parenting Stress and ASD

Previous research has consistently demonstrated elevated stress in parents of children with ASD (Estes et al., 2009; Estes et al., 2013; Hayes & Watson, 2013; Sanders & Morgan, 1997; Smith et al. 2001). Whereas normal amounts of stress can be adaptive, excessive amounts of stress can be harmful for both the parents and the child (Davis & Carter, 2008). For example, parents of children with ASD have reported elevated levels of stress, higher emotional symptoms, and are generally diagnosed with more mood and anxiety disorders than parents of typically developing children (Baker et al., 2002; McKinner & Peterson, 1987) and parents of children with other developmental disabilities (Holyroyd & McArthur, 1976). In addition, the families of children with ASD may experience additional unique struggles, above and beyond elevated parental stress levels. These familial stressors include financial difficulties; marital or relationship challenges; social isolation for the parent and child; educational problems, such as the need for specialized structure and learning; medical complications or extensive appointments for testing and behavioral treatment; and, lastly, navigation through the grief stages associated with their child's diagnosis of ASD (Norton & Drew, 1994; Tunali & Power, 1993). Navigation through the grief stages can be particularly challenging for many families with a child who has ASD because the implications of the diagnosis never goes away. These families are continuously learning to cope and manage their own life stress while dealing with the "loss" of many things that come with having a child with typical development (Mori, Ujiie, Smith, & Howlin, 2009). Although most children progress through developmentally stressful stages and most families experience situational stress, the stressors for families who have a child with ASD appear quite different from those for families of typically developing children. These stressors are more often

present or more challenging because of the increased care demands associated with the developmental disability (Estes et al., 2009).

Predictors of parenting stress are typically broken down into three related but separate domains that all influence the magnitude of stress in the parent-child system: parent characteristics, child characteristics, and situational/demographic life stress (Abidin, 2012). Of the three, child factors have been the most widely researched. One important focus for research investigating the experiences of parents of children with ASD has been to examine the relation between child characteristics and the types of stress experienced by their parents. Many early studies initially focused on the child's core autism symptoms and behaviors as major contributors to parenting stress. Bebko, Konstantareas, and Springer (1987) published one of the first studies examining this relation, finding both clinicians and the parents agreed the most stressful autism-related symptoms for parents of school age children with ASD were impairments in communication, deficits in social interactions and uneven cognitive abilities. Hastings and Johnson (2001) examined a different aspect of parenting stress in a sample of early school-aged children and found a positive association between higher levels of parenting stress and higher levels of autism symptoms. It should be noted that children's autism symptoms were not rated objectively; rather the symptom ratings were taken from a parent checklist. Therefore, it is probable that the children's behaviors were rated as more severe by the parents who had higher stress levels. More recently, Estes and colleagues (2009) found that mothers of children with ASD (Mean age = 43.88 months) had significantly higher levels of psychological distress in addition to increased parenting stress when compared to mothers of children with developmental delays (Mean age = 43.74 months). Additionally, Estes and colleagues (2013) found that parent of toddlers with ASD reported increased parenting related stress when compared to parents of

children with other developmental delays and typical development. Furthermore, in a meta-analysis conducted by Hayes and Watson (2013) families of children with ASD had significantly higher stress compared to families of typically developing (TD) children and families of children with other disabilities. These studies when examined together suggest that the autism symptoms expressed by children are a source of parenting stress for parents of children who are preschool aged and older. It is important to explore additional child factors that may contribute to the stress parents experience when raising a child with ASD. Studies examining child factors associated with parenting stress for parents of typically developing children have found that child externalizing behaviors are positively linked to parenting stress (Gutermuth Anthony et al., 2005; Morgan et al., 2002). The current study investigated one specific type of externalizing behavior, hyperactivity. In the following sections research on externalizing behaviors and its association with ASD is reviewed.

Externalizing Behavior

Overview

Externalizing behavior problems encompass the majority of maladaptive behaviors exhibited among school-aged children (Donenberg & Baker, 1993; Efstratopoulou, Janssen, & Simons, 2012; Webster-Stratton, Reid, & Beauchaine, 2012). Externalizing behavior is an all-encompassing term referring to a variety of problem behaviors characteristically including hyperactivity, noncompliance, impulsivity, aggression, and delinquency outwardly manifested, reflecting how the child is adversely acting on the external environment (Donenberg et al., 1993; Liu, 2004). Children's presentation of these externalizing behavior problems varies across different settings, particularly between the home and school (Kazdin, 1995; Kazdin & Kagan, 1994). Researchers suggest that in general, teachers are more likely to accurately report

disruptive behaviors such as hyperactivity and inattention compared to parents, because they are more sensitive to these behaviors and they are able to compare behaviors across other students in the classroom. Limited research however has examined the presence of these specific behaviors among young children with ASD and the associated negative impact of these behaviors.

Externalizing behavior problems in children who are typically developing is well documented (Eisenberg et al., 2003a, 2003b; Hinshaw, 1992). Researchers have demonstrated the association between childhood externalizing behavior problems and the later development of more severe psychopathology and delinquent conduct during adolescent and adult life (Webster-Stratton & Hammond, 1997). Past research has established that externalization leads to negative outcomes across diagnostic status, such as ASD, attention-deficit hyperactivity disorder (ADHD) or other developmental disabilities, suggesting that children with a primary diagnosis who also present with externalizing behavior may be more at risk than children with just the primary diagnosis alone. For example, children with ASD may be particularly at risk for these negative outcomes due to the range of additional deficits and risk factors associated with their primary diagnosis, which include poor interpersonal and social adjustment, deficits in adaptive functioning skills, and decreased functional independence (Zaidman-Zait et al., 2010). The following section reviews the current research on externalizing behavior problems in children with ASD.

Externalizing Behavior and ASD

Young children with ASD often present with additional behavioral problems, such as hyperactivity, impulsivity, aggression, or inattention (Campbell & Malone, 1991). Estimates are that as high as 16 % of children with ASD have significant externalizing problems (Hanson et al., 2013). Recent research has demonstrated that children with ASD score significantly higher

on measures of externalization than their typically developing peers (Mahan & Matson, 2011). This is consistent with previous research demonstrating that these children engage in more aggression towards peers and show increased levels of hyperactivity and impulsivity (Fodstad, Rojahn, & Matson, 2012; Humprey & Symes, 2011; Matson & Rivet, 2008). Externalizing behavior problems in children with ASD have been associated with a variety of negative outcomes. Children with both ASD and externalizing behavior problems have increased rates of victimization and bullying compared to their typically developing peers (Cappadocia, Weiss, & Pepler, 2012). Further, the externalizing problem of aggression has been specifically associated with increased anxiety among these children (Niditch, Varela, Kamps, & Hill, 2012). Externalizing problems also have been associated with significantly decreased health-related quality of life scores compared to children without these behavioral problems, potentially resulting in many negative collateral effects to both their mental and emotional health (Kuhlthau et al., 2010). One potentially influential type of externalizing problem for children with ASD is hyperactivity.

Hyperactivity

Hyperactivity is a type of externalizing behavior that involves two unique sets of problems: (a) excessive movement, or restlessness, and (b) attention deficits, low levels of concentration, or distractibility (Lui, 2004). The *DSM–5* defines children who display any combination of these behaviors using the term "attention-deficit hyperactivity disorder" (ADHD) (APA. 2013). Current research indicates that boys are more likely to have hyperactivity and inattention than girls and thus are more often diagnosed with ADHD (APA, 2000). This is similar to the prevalence rates of ASD; boys are 4 times more likely than girls to receive this diagnosis (CDC, 2013). In the previous version of the *DSM* (4th ed.; text rev. *DSM-IV-TR;* APA,

2000) guidelines for ASD include exclusionary criteria for the diagnosis of ADHD but previous research indicates that children with ASD display hyperactive behaviors (Aman, 2004; Lee & Ousley, 2006; Yerys et al., 2009). This research is consistent with the new *DSM-5*, which does not include exclusionary criteria for the diagnosis of ASD and ADHD (APA, 2013). For the purposes of the current study, the term "hyperactivity or hyperactive" will be used as a broad label inclusive of several versions of diagnostic criteria. This general descriptive term was chosen rather than a more specific diagnostic label because the research reviewed below includes participants who met differing diagnostic criteria for ADHD but who would all adequately be described by the general term "hyperactive." In addition, the hyperactivity subscale of the BASC-2 will be utilized as an externalizing behavior measure for the current study.

Researchers suggest that hyperactive children may experience a variety of social, cognitive, behavioral and academic problems throughout the school age period (Cicchetti, 1989), and are at increased risk for difficulties adjusting to new or challenging situations later in life (Widom, 1989). In addition, these children have either a direct or indirect impact on their environment and their family, thus causing the parents of these children many challenges. For example, families of hyperactive children report higher levels of conflict (i.e. a direct impact); are more likely to suffer from paternal alcoholism, maternal depression, and social isolation; feel less satisfied with their skills as a parent; and, in turn, rate themselves as less competent (i.e. indirect impacts) than families without children with behavioral problems (De Wolfe, Byrne, & Bawden, 2001; Mash & Johnston, 1983, 1990). In addition, these parents experience higher levels of stress, which is associated with less self-care habits, such as lack of sleep, particularly for parents of children with developmental disabilities (Gallagher et al., 2010). Because of the variety of negative outcomes associated with the presence of hyperactivity, this may be a

vulnerability factor for children with ASD, who are recognized as being especially susceptibility to negative developmental outcomes due to the social and language deficits associated with their ASD diagnosis (Begun, 1993; Engle, Castle, & Menon, 1996). Therefore, additional research is needed to investigate how the presence of child hyperactive behaviors may influence parents of children with ASD. The increased care demands associated with having a child with ASD and problems with hyperactivity may negatively impact parental functioning, which may in turn contribute to the maintenance or exacerbation of child behavioral problems (Anastopoulos, Guevremont, Shelton, & Du-Paul, 1992).

Parenting Stress, Externalizing Behaviors, and ASD

The link between high levels of parental stress and child behavior problems has been well documented in children who are typically developing, however less is known about the relations between these variables for children with ASD (Crnic, Gaze, & Hoffman, 2005; Davis & Carter, 2008). There is evidence suggesting that the direction of the relations between these constructs may be bi-directional. Child behavior problems may create increased parenting stress but there is also evidence suggesting that externalizing behaviors exhibited by children may occur in response to parental stress (Baker & Heller, 1996; Patterson, 1982). In addition, parent perceptions of children's behavior may contribute to this cycle. Mothers who typically perceived their child's behavior as more irregular reported more elevated stress levels than mothers who perceived their child's behavior as normal (Crnic et al., 2005). Further Crnic and colleagues found that both life stress and parenting daily hassles remained relatively stable over time, predicting affective, and behavior problems in a sample of typically developing preschool-aged children over a period of 2 years.

Whereas little research has been conducted on the association between specific problem behaviors, such as hyperactivity, among young children with ASD and parenting stress, a limited number of studies have found associations between parental stress and clusters of behavior problem symptoms. For instance, externalizing behavior problems as a whole predicted higher levels of parenting stress for parents of children and adolescents with ASD, and continued to be a better predictor of parenting stress over time (Lecavalier, Leone, & Wiltz, 2006). Davis and Carter (2008) found similar results in their study of 54 toddlers with ASD, reporting that parents of children with ASD who also displayed externalizing behavior problems had high levels of parenting stress. It should be noted that the exact nature of externalizing behaviors was not specified in either study rather the term externalizing was used as an all-encompassing term for behavior problems. Moreover, it has been demonstrated that parents of children with disabilities who experienced high levels of parenting stress tended to associate their stress levels with their child's problem behaviors above and beyond what could be accounted for by the child's developmental delay alone (Baker et al., 2003). Sikora and colleagues (2013) examined overall family functioning among families of children with ASD finding that higher parent reported externalizing behavior problems was associated with lower levels of family functioning. In another recent article by Estes and colleagues (2013), child behavior problems significantly predicted parenting related stress and associated psychological distress among mothers of children with ASD. In addition, research has shown that parents of children with ASD and parents of children who exhibit externalizing problems experience similarly high stress levels (Donenberg & Baker, 1993; Dumas, Wolf, Fisman, & Culligan, 1991). For example, parents of children who displayed externalizing behavior problems reported elevated levels of child-related stress, more negative associations about parenting and a decreased satisfaction in their overall

social life compared to parents of typically developing children (Donenberg & Baker, 1993). Similar results were found when examining reports of parents of children with autism. These parents reported that having a child with a challenging developmental disability had a high negative impact on their parenting. Based on these reports, child characteristics associated with ASD and externalizing behavior problems may combine to create even higher levels of stress for these families. Therefore, given the high levels of stress associated with raising children with ASD and raising children with externalizing problems, it is important to examine the unique challenges involved in parenting children with both ASD and externalizing problems and how these challenges are related to parenting stress. Although we know that parents of children with ASD and parents of children with externalizing behavior problems both experience higher levels of stress (Donenberg & Baker, 1993; Dumas et al., 1991), less is known about the unique and joint contributions of these characteristics. Further, little research has investigated specific externalizing problems such as hyperactivity and how these child problems influence parenting stress. For example, parents of hyperactive children are more likely to experience significant problems compared to other families with typically developing children (Mash & Johnston, 1990). For example, these parents are more likely to suffer from negative parenting outcomes and increased life related stress than parents with children who are not experiencing behavioral problems (Mash & Johnston, 1990).

Given that almost all of the previous research on the relation between diagnostic status and parenting stress has examined only externalizing behaviors as a whole construct, more information is needed regarding specific externalizing problems such as, hyperactivity, in children with ASD. Understanding relations between parenting stress and hyperactivity in children with and without ASD may facilitate the development of better interventions for these

parents and children. In recent years, there has been increased recognition that interventions are necessary for the entire family system, not focused only on the child (Hall & Graff, 2012; McIntyre & Brown, 2013). Therefore, the effect of caring for a child with ASD who also has behavior problems needs to be understood for both the parents and children in order to aid in more purposeful treatment planning.

Hypotheses

The current study examined the externalizing behavior, hyperactivity, in relation to child diagnostic status (ASD versus typically developing) and parenting stress. Based on previous research, the following hypotheses were made:

Hypothesis 1

Child diagnostic status (ASD versus typically developing) will predict parenting stress levels as estimated by each subscale separately, i.e., parental distress (PD), parent-child dysfunctional interaction (PCDI), and difficult child (DC), as well as the total stress composite. Numerous studies have shown that parents of children with ASD experience more overall stress than parents of non-disabled or typically developing children (Baker et al., 2002; Holroyd & McArthur, 1976; McKinner & Peterson, 1987). Therefore, I expected that parents of children with ASD would have higher levels for the overall and the three specific areas of parenting stress [parental distress (PD), parent-child dysfunctional interaction (PCDI), and difficult child (DC)] than parents of children who are typically developing.

Hypothesis 2

Child diagnostic status (ASD versus typically developing) will predict severity of child hyperactivity. Recent research has demonstrated that children with ASD score significantly higher on measures of externalization than their typically developing peers (Mahan & Matson,

2011). In addition, children with ASD often present with "comorbid" ADHD symptoms which include hyperactivity (Leyfer et al., 2006). Thus, I hypothesized that children with ASD would have a higher frequency of hyperactivity than children who are typically developing.

Hypothesis 3

Hyperactivity will predict total parenting stress levels. Little research to date has examined the specific effects of the externalizing behavior, hyperactivity, on total parenting stress; therefore, this hypothesis is somewhat exploratory. Nevertheless, previous extensive research has documented that childhood externalizing is associated with increased parenting stress in typically developing children and children with ASD, at least for children with mean ages 2- to 9-years (e.g. Crnic et al., 2005; Davis & Carter, 2008; Dumas et al., 1991; Estes et al., 2009; Lecavalier et al., 2006). Further, researchers have shown that parents of hyperactive children are more likely to experience significantly higher stress levels compared to other families with typically developing children (Mash & Johnston, 1990). Specifically, it was hypothesized that the presence of child hyperactivity would predict higher parenting stress scores, regardless of diagnostic status.

Hypothesis 4

Child hyperactivity will moderate the relation between children's diagnostic status and parental stress level. This moderation model is shown is Figure 1. Specifically, I hypothesized that the interaction between hyperactivity and diagnostic status would create a synergistic effect in which higher scores of hyperactivity will strengthen the effect of diagnostic status on parenting stress scores. Thus, it is likely that both typically developing children and children with ASD who have high levels of hyperactivity will have parents with higher parenting stress scores than children who have low levels of hyperactive behaviors. In addition to differences in

parenting stress within groups based on child hyperactivity, I expect that child hyperactivity will differentially affect parenting stress between groups. Specifically, child hyperactivity will have a stronger effect on parenting stress in the ASD sample, suggesting hyperactivity might be a vulnerability factor for children with ASD.

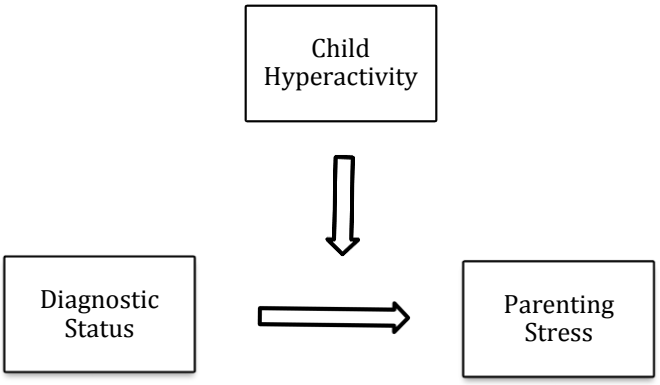

Figure 1. Proposed moderation model of the effects of child hyperactivity on the relation between diagnostic status and parenting stress.

To my knowledge, no research has examined the potential moderating effects of the specific externalizing behavior, hyperactivity, in children with ASD. Although this has not been specifically examined, research by Donenberg & Baker (1993) linked similar significant increases in parenting stress levels among parents of children with externalizing behaviors and parents of children with ASD. Thus, the presence of hyperactivity will likely increase parenting stress for both groups. Furthermore, when hyperactivity is combined with the already challenging symptoms of ASD, these children will show a stronger externalizing effect compared to children without ASD increasing the overall level of parenting stress.

Hypothesis 5

Hyperactivity will affect the three different types of parenting stress for each group (ASD versus typically developing). Based on previous research, Abidin (1995) suggests that child

characteristics (i.e. child hyperactivity) should independently influence parenting stress based on the characteristics of the parent and other situational life stressors. Abidin (1995) also suggests that each of the three domains of stress can separately be influenced by child characteristics. Several studies found that parents of children with ASD had significantly higher levels of psychological distress and parent-related stress when compared to parents of children with developmental delays and typical development (Estes et al., 2009; Estes et al., 2013; Hayes & Watson, 2013). Additional studies examining child factors associated with parenting stress for parents of typically developing children have found that child externalizing behaviors (i.e. hyperactivity and aggression) are positively linked to parenting stress (Gutermuth Anthony et al., 2005; Morgan et al., 2002). Little research has examined the specific effects of hyperactivity on the three subtypes of parenting stress; therefore these hypotheses are somewhat exploratory. It is hypothesized that child hyperactivity will increase stress in each of the three domains, parental distress (PD), parent-child dysfunctional interaction (PCDI), and difficult child (DC) in addition to the overall increase in the composite of parenting stress.

CHAPTER II

Method

Participants

This study was part of a larger project investigating self-regulation in young children with ASD and those who are typically developing. The current study was approved by the Seattle Pacific University Institutional Review Board. To qualify for inclusion in the study, children were required to meet the following criteria: (a) fall between the ages of 3-years-0-months and 6-years-11-months at the time of enrollment; (b) display adequate receptive and expressive language skills as measured by a score of 85 or higher on the Differential Abilities Scales – Version II (Elliott, 2007) and ability to follow short oral directions; (c) children with ASD were required to have a confirmed ASD diagnosis, inclusive of Asperger's disorder, autistic disorder, or PDD-NOS; and (d) typically developing children could not exhibit high levels of behaviors characteristic of ASD and had to score lower than 15 on a screen for symptoms of ASD called the Social Communication Questionnaire – Current Form (Rutter, Bailey, & Lord, 2003), could not have an existing psychiatric or developmental disorder, and could not have a sibling with ASD.

Participants included 64 children between the ages of 3-years-0 months and 6- years-11 months. Thirty-nine children were included in the typically developing group and 25 children were included in the ASD group. Demographic information is presented in Table 1. The groups were not significantly different in terms of chronological age, parent's gender, ethnicity, marital status, or salary. However, the groups were significantly different in several notable areas including: (a) child gender, where there were more females in the typically developing group (43.6%) than the ASD group (12%); (b) verbal ability, indicating that children in the typically developing group had significantly higher scores (M = 111.79, SD = 11.30, range = 92 to 146)

on expressive and receptive language than the ASD group (*M* = 98.68, *SD* = 11.58, range = 78 to 117) (DAS-II; Elliot, 2007); (c) parent education, where parents in the typically developing group had a higher number of years of education (12.8% professional degree) compared to parents in the ASD group (4% professional degree).

Table 1
Demographic Characteristics by Group

Variable	ASD	TD	*t*	Cohen's *d*
Child Variables				
Gender N (%)			-3.03**	0.74
Female	3 (12%)	17 (43.6%)		
Male	22(88%)	22 (56.5%)		
Average chronological age in months (*SD*)[range]	57.92 *(14.00)* [36.00, 83.00]	55.49 *(13.50)* [36.00, 83.00]	-.69	0.18
Average verbal Ability *(SD)* [range]	98.68 *(11.58)* [78.00, 117.00]	111.79 *(11.30)* [92.00, 146.00]	4.49***	1.15
Ethnicity, N (%)			-1.04	0.26
White/Caucasian	16 (64%)	31 (79.5)		
African American	0	0		
Hispanic/Latino	2 (8%)	0		
Native American/Alaskan Native	0	0		
Asian American/Pacific Islander	6 (24%)	7 (17.9%)		
Multiethnic	1 (4%)	1 (2.6%)		
Family Variables				
Parent Gender, N (%)			-.35	0.09
Female	21 (84%)	34 (87.2%)		
Male	4 (16%)	5 (12.8%)		
Martial status, N (% married)	37 (94.9%)	25 (100%)	1.28	0.29
Parent Education, N (%)			2.16*	0.56
High School	1 (4%)	0		
Some college	8 (32%)	4 (10.3%)		
Bachelor's degree	8 (32%)	15 (38.5%)		
Some masters	1 (4%)	3 (7.7%)		
Master's degree	4 (16%)	6 (15.4%)		
Some professional	2 (8%)	6 (15.4%)		
Professional degree	1 (4%)	5 (12.8%)		
Average annual income *(SD)*	122038.92 *(156453.07)*	139015.2308 *(119612.7893)*	.49	0.12

Note. $N = 64$. Verbal ability = Verbal Reasoning Cluster Standard Score from DAS–II.
*p < .05, ** p < .01, ***p < .001

Procedure

Recruitment of participants. Families were recruited throughout the greater Seattle area utilizing a variety of different methods. For example, participants were recruited through public

and private school in the districts of King, Snohomish, and Pierce counties, autism centers, mental health clinics, community events (e.g., informational fairs and classes for parents of children with ASD) and special education programs in the greater Seattle area. Graduate and undergraduate members of the research team set up informational tables at these locations to speak with parents about the study and handout informational flyers. These handouts included a QR barcode that parents could scan via smartphone to find out more information about the study as well as graduate student contact information to sign up for participation. Furthermore, we posted announcements in local magazines (e.g., *Parent Map*, *Seattle Child Magazine*) and on listservs (e.g., Microsoft, www.featwa.org). Undergraduate research assistants also posted pull-tab flyers at libraries, community centers, coffee shops, and shopping markets throughout the greater Seattle area. If parents indicated that they would like to be part of the study, we called and/or emailed the parent to explain the study in more detail and scheduled the first of two visits, the enrollment visit, which served as the screener for inclusion in the study. Following enrollment in the study, a graduate student was assigned to the family serving as the lead evaluator responsible for coordination of the visits and data collection. Data collection occurred across two sessions, the enrollment visit and university visit.

Enrollment visit. The enrollment visit lasted approximately 60-90 minutes and took place in the participant's house, a local library, or our laboratory at Seattle Pacific University, depending on the family's preference. A graduate student assessor, with the help of an undergraduate research assistant, conducted the visit. The purpose and details of the study were explained to families after which both written parental consent and oral child assent to participate in the study were obtained during this visit. Parents of children with ASD were also be asked to sign a medical release form, which allowed the researchers to contact the diagnosing provider for

the initial diagnostic report in order to confirm diagnostic status. Parents also completed a teacher release form, which allowed us to contact the child's teacher to fill out questionnaires about the child's skills and behaviors within the school setting. Teachers received a study packet which contained an introductory letter, a copy of the release form, a prepaid self-addressed envelope, and several questionnaires, including the Behavioral Assessment System for Children, (BASC-P-TRS, BASC-TRS*;* Reynolds & Kamphaus, 2004), used to assess the severity of externalizing behaviors in children with ASD and those who are typically developing. Following the consent process and obtainment of release forms, parents were asked to complete a packet of questionnaires while the child was directly assessed.

Parental questionnaires asked parents for information regarding family demographics and characteristics or behaviors of their children at the enrollment visit. The Social Communication Questionnaire - Current Form (Rutter et al., 2003) was used as a screener for symptoms of ASD which, upon completion was reviewed to ensure that the child met criteria for inclusion in the study. In addition, parents completed the Parenting Stress Index – Short Form (PSI-4-SF; Abidin, 2012), which estimated the magnitude of stress within the parent-child relationship. During this visit, children also completed a series of tasks, including the verbal reasoning cluster of the Differential Abilities Scale – Version II (Elliot, 2007). If the child's behavioral and verbal scores met the predetermined cut-offs, then the second visit, the university visit, was scheduled with the family. However, if the child's scores did not meet the predetermined cut-offs, then the family was thanked for their time and potentially re-contacted again after 6 months depending on the age at enrollment of the child.

University visit. The university visit was approximately 90-120 minutes in duration and took place in Dr. Wilson's Developmental Lab at Seattle Pacific University. Children and

parents completed a variety of tasks for both parents and children as part of the larger study. While the child was participating in these tasks, the parent was in a separate room with a research assistant where they completed an interview and finished any remaining questionnaires. During this time they were able to watch their child on a video monitor. At the end of the visit, parents received $50 and a $5 coffee card for their participation. Children received a small gift worth roughly $5 and a variety of stickers.

Measures

Demographic variables. Parents completed a demographic questionnaire as part of the larger study. Parents filled out the questionnaire and indicated their child's date of birth, gender, and other family demographic variables such as family income and parent education. For the purposes of this study, information regarding family income and parent education was collected as potential control variables.

Diagnostic status. Social Communication Questionnaire - Current Form (SCQ; Rutter et al., 2003). Diagnostic status for children with ASD was established by obtaining diagnostic reports copies from their parents or by obtaining a release of information in order to obtain records directly from the diagnosing provider. In addition to diagnostic records, diagnostic status was further supported by using an autism screening questionnaire, the Social Communication Questionnaire – Current Form (SCQ; Rutter et al., 2003). The SCQ was designed as a screener to accompany a full ASD assessment if needed. This measure has been supported for use with children ages 3 to 5 (Allen, Silove, Williams, & Hutchins, 2007). This parent-report questionnaire contains 40 items that assess communication and social interaction functioning. This measure includes items in three areas: communication, social interaction and the restricted, repetitive, and stereotyped patterns of behavior domain. The SCQ is to be completed by a parent

or other primary caregiver. Each item is scored as a 1 or 0 based on the forced choice format of "y*es*" or "*no,*" the entire questionnaire takes approximately 10 minutes to complete. The SCQ's sensitivity is 85% and specificity is 75% when using a cutoff score of 15 (Berument, Rutter, Lord, Pickles, & Bailey, 1999). The SCQ is considered a reliable measure with internal reliability coefficients (Cronbach's alpha) ranging from .84 to .93 (Rutter et al., 2003). The SCQ has high discriminant validity, .088, when differentiating ASDs from other disorders (Berument et al., 1999).

Verbal ability. Differential Ability Scale – Version II (DAS-II; Elliott, 2007). The DAS-II is a measure of cognitive abilities in children ages 2:6 to 17:11. This measure was used to screen for verbal abilities to ensure that participants in both groups had the capacity of understand the directions for each task, specifically, the ability to follow oral three-step commands. The DAS-II Early Years cognitive battery for children ages 2:6 to 6:11 was used for the present study. Specifically, only the Verbal Reasoning cluster was administered, which contains two subtests: the Verbal Comprehension subtest, which measures receptive language, and the Naming Vocabulary subtest, which assesses expressive language. These two subtests of the DAS-II took approximately 15 minutes to complete. Items are scored "1" for a correct response or "0" for an incorrect response. The sum of these two subtests was then converted into a T score with a mean of 100 and a standard deviation of 10.

The DAS-II was standardized and normed on a sample of 3,480 children, aged 2 years 6 months to 17 years, 11 months. The reported average reliability estimates for the Early Years battery was .93 for the lower age range, and .89 for the upper age range across the clusters (Elliott, 2007). Test-retest correlation coefficients yielded a reliability estimate of .89 for the Verbal Reasoning Cluster. In addition, the DAS-II has adequate convergent validity, with an

average mean correlation of .80 when correlated against other cognitive ability tests (Elliott, 2007).

Hyperactivity. Behavioral Assessment System for Children, Second Edition, Preschool and Elementary Versions, Parent Rating Scales and Teacher Rating Scales (BASC-P-PRS, BASC-PRS, BASC-P-TRS, BASC-TRS; Reynolds & Kamphaus, 2004). Researchers designed the BASC to categorize disorders related to emotions and behaviors. This measure also helps in the development of treatment plans for these disorders (Reynolds & Kamphaus, 2004). These parent and teacher reports measure adaptive and problem behaviors in preschool children aged 2:0-5:11 and elementary school children aged 6:0-11:11. The preschool parent report form contains 134 questions and the elementary school version contains 160 questions. The preschool teacher report form contains 100 questions and the elementary version contains 139 questions. All four versions of the BASC questionnaires are formatted on a 4-point Likert scale where the parent or teacher endorses responses of (1) *never*, (2) *sometimes*, (3) *often*, (4) and *almost always*. Each questionnaire takes approximately 10-20 minutes to administer.

The BASC-2 was standardized on 12,850 cases from over 375 testing sites. Tests of internal consistency (Cronbach's alphas) yielded .83 to .91 for the Teacher Rating Scale, and Cronbach's alphas from .80 to .84 for the Parent Rating Scale across ages 2 to 7. The entire BASC was administered as a part of the larger study. For the purposes of this study, only the BASC-P-TRS, BASC-TRS, BASC-P-PRS, and BASC-PRS hyperactivity clinical scale was utilized in analyses. This scale was designed to measure the tendency to be overly active, hurry through activities or act without thinking (Reynolds & Kamphaus, 2002). The number of items in the preschool versus elementary school hyperactivity scales is 9 and11, respectively. When compared to the Social Skills Rating System (SSRS; Gresham & Elliott, 1990), the BASC-TRS

and BASC-PRS Hyperactivity content scale was positively correlated (0.50 to 0.60) and (0.50 to 0.56) with the Problem Behaviors Scale of the SSRS, in the teacher and parent groups, respectively, suggesting convergent validity (Flanagan, Alfonso, Primavera, Povall, & Higgins, 1996). Test-retest correlation coefficients (Cronbach's alphas) for the Hyperactivity content scale yielded reliability estimates of .88 to .94 for the Teacher Rating Scale, and estimates of .74 to .81 for the Parent Rating Scale.

Parenting Stress. Parenting Stress Index, Fourth Edition Short Form (PSI-4-SF; Abidin, 2012). The PSI-SF is one of the most widely utilized instruments for measuring various aspects of parenting stress in families of children with ASD (Zaidman-Zait et al., 2010). The PSI-SF is a brief version of the parenting stress index (Abidin, 1995), a well-researched and commonly used measure of parenting stress, designed to identify various levels of parenting stress experienced within the parent-child relationship (Abidin, 1995; 2012). The short form contains 36 items from the original 120-item PSI-4, measuring three domains of parenting stress, as reported by the child's caregiver, for children ages 1:0 through 12:0. The three subscales are: parental distress (PD), parent-child dysfunctional interaction (PCDI), and difficult child (DC), each contain 12 items. The PD subscale measures the distress associated with personal factors related to parenting, such as social support "Not as interested in people as I used to be," competence "Feel that I cannot handle things," or parental depression "Quite a few things bother me." The PCDI subscale assesses the degree to which the parent believes the child does not meet their expectations and does not feel fulfilled with their interactions "child does not like me or want to be close," their attachment perception "child does things that bother me to be mean," or acceptability "child doesn't learn as quickly as other children." The DC subscale addresses parenting stress associated with emotional and behavioral characteristics of the child in which he

or she is perceived as easy or difficult to manage, due to either difficult temperament "child is moody and easily upset" and/or noncompliant, demanding behavior "child does some things that bother me a lot." The entire PSI-4-SF was administered to assess the total parenting stress index and the three subscales. The total PSI-SF score combines all of these three subscales and is seen as a marker of overall parental experience of stress.

The 36 items are formatted on a 5-point Likert scale where the parent rates each item as: (1) *strongly disagree*, (2) *disagree*, (3) *neutral*, (4) *agree*, (5) *strongly agree*. The PSI-SF took approximately 10 minutes to complete. Subscale scores range from 12 to 60, while the total stress index score ranges from 36 to 180 with higher scores indicating higher levels of parenting stress. Normal scores are expected to fall between the 15th and 80th percentile, individuals scoring at or above the 85th percentile for any of the specific subscales (PD, PCDI, or DC subscale) indicates that additional supports are necessary. In addition, those receiving a total score at or above the 90th percentile for the total stress index represent the clinical range of parental stress, indicating that additional supports are necessary (Abidin, 1995). For the PD, PCDI, and DC subscales the 85th percentile scores are 33, 26, and 33 respectively.

The PSI-SF has been shown to be a valid and reliable measure when used with parents of typically developing children and those with ASD (Abidin, 1995; Zaidman-Zait et al., 2010). The PSI-SF was standardized and normed on a sample of 840 parents. The reported internal consistency (Cronbach's alphas) in the normative sample was .91 for Total Stress, .87 for parental distress (PD), .80 for parent-child dyfunctional interaction (PCDI), and .85 for difficult child (DC). In addition, Zaidman-Zait and colleagues (2010) conducted an item response theory analysis of the PSI-SF in a sample of 141 families with children who had ASD and reported internal reliability coefficients (Cronbach's aphas) of .80 to .88 for the aforementioned scales.

When compared to the Full-Length form, the PSI-SF has been found to positively correlated across all content, Total Stress = .94, Parental Distress and Parent Domain = .92, and Difficult Child and Child Domain = .87 suggesting convergent validity (Abidin, 1995).

CHAPTER III

Results

Power Analysis

An a priori power analysis was conducted using statistical calculator software, G*Power 3 (Faul, Erdfelder, Lang, & Buchner, 2007) to determine the appropriate number of participates needed to have adequate power for the analyses. Five variables were entered as predictors: diagnostic status (ASD versus typically developing), and hyperactivity score as testable predictors, and verbal IQ, age, and gender as controlled predictors. The selected statistical power was set to .80, a standard alpha of 0.05 was selected, and a Cohen's f^2 effect size was set at .15, which reflects a medium effect size. This conservative effect size was selected for two specific reasons: (a) the present project is not a true experiment and (b) previous research using regression analyses to examine hyperactivity and parenting stress has not been published in a young sample of individuals with ASD (Davis & Carter, 2008; Donenberg & Baker, 1993; Dumas et al., 1991; Lecavalier et al., 2006; Mash & Johnston, 1990). Based on these criteria, it was estimated that a minimum of 68 participants was needed to achieve significant power. Due to the sample size of the current study (N = 64), analyses were slightly underpowered to find statistical significance.

Data Entry and Preparation

All data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS) Version 22 software. Parent education level was entered as a categorical variable. Parent income level was entered as a continuous variable. Children's age in months was entered as continuous values. Diagnostic status, was dummy coded (-1 = *typically developing* and 1 = *ASD*). Parents completed the PSI-4-SF (Abidin, 2012) as a report for each category of parenting stress and total stress. Standardized T-scores and percentiles were entered for the subscales of

parental distress (PD), parent-child dysfunctional interaction (PCDI), and difficult child (DC) as well as for the Total Stress Composite. Parents and teachers completed the BASC-2 (Reynolds & Hamphaus, 2004) as a report for hyperactivity. Standardized T-scores and percentiles were entered for the subscales of Hyperactivity. In order to prepare the data for the moderation analysis, an interaction term was created by multiplying the dummy coded independent variable (status) with the moderator variable (hyperactivity).

Data Screening

Data were entered into SPSS twice for all questionnaires (Demographic, PSI-4-SF, BASC-2) to ensure accuracy and limit errors. Prior to analysis, data were screened for missing data, outliers, and to examine the assumptions of parametric data. All children completed the DAS-II verbal abilities measure. No missing data were found for the parent reported stress from the PSI-4-SF. Data were missing for parent reported hyperactivity from the BASC-2 (1.56%) and teacher reported hyperactivity from the BASC-2 (9.38%). As suggested by Jeličić, Phelps, and Lerner (2009), multiple imputation (MI) was used to address the missing data in my sample. Multiple imputation is a statistical technique that replaces missing data with a series of replicated values based on the observed data set by creating multiple data sets, usually five, of imputed data that are analyzed independently. The results are then pooled by computing the mean over the repeated analysis to produce a single parameter estimate. The original data set was imputed five times using SPSS-Version 22. The analyses described below were conducted on the imputed dataset.

Prior to analyses, continuous variables were examined to test the assumptions for analyses utilizing multiple linear regression. Data were evaluated for outliers by examining the means and standard deviations with a visual inspection of boxplots and histograms. The

Kolmogorov-Smirnov test (K-S test) was conducted to examine normal distribution of study variables. Skewness and kurtosis values and z-scores were then examined to provide further information regarding distribution with estimates ≥ 1.96 considered significant (Field, 2009). These results are presented in Table 2.

Table 2
Normality of Continuous Variables

Variable	K-S Test of Normality			Kurtosis		Skewness	
	D	*df*	*P*	kurtosis	*z*	skewness	*z*
PD	0.10	56	.20	1.26	2.00	-.12	-0.38
PCDI	0.16	56	.00	-.31	-.49	.81	2.53
DC	0.16	56	.00	-.72	-1.14	.61	1.91
Parenting Stress Composite	0.17	56	.00	-.47	-.75	.68	0.02
Hyperactivity, PR	0.11	56	.09	-.31	-0.49	.66	2.06
Hyperactivity, TR	0.13	56	.02	.31	0.49	.90	2.81

Note. N = 64. Hyperactivity, PR = parent report from BASC-2; Hyperactivity, TR = teacher report from BASC-2; PD = Parental distress from PSI-4-SF; PCDI = Parent-child dysfunctional interaction from PSI-4-SF; DC = Difficult child from PSI-4-SF.

Levene's Test for equality of variances was used to examine homoscedasticity among variables. As shown in table 3, Levene's test yielded significant values for several study variables, indicating that the variances between parent reported variables (i.e. marital status, PSI-4-SF scales, and BASC-2 hyperactivity subscale) were significantly different.

Table 3
Homogeneity of Variance in Continuous Variables

Variable	Levene Statistic
Chronological age	0.03
Verbal ability	0.32
Ethnicity	2.13
Marital Status	4.41*
Education	0.81
Annual Salary	0.21
Parenting Distress (PD)	1.76
Parent-Child Dysfunctional Interaction (PCDI)	8.48**
Difficult Child (DC)	6.65*
Parenting Stress Composite	6.93*
Hyperactivity, PR	8.11**
Hyperactivity, TR	2.73

Note. $N = 64$. Verbal ability = Verbal Reasoning Cluster Score from DAS-II; Hyperactivity, PR = *T*-scores from BASC-2 Parent Rating Scales; Hyperactivity, TR = *T*-scores from BASC-2 Teacher Rating Scales.
*$p < .05$. ** $p < .01$.

Data were also screened for multicollinearity by examining correlations between study variables as presented in Table 4. Following recommendations by Field (2009) correlations exceeding $p = .90$ where considered highly correlated. A value exceeding $p = .90$ was only found among the parenting stress composite and the subscales indicating multicollinearity was not present among variables other than that the parenting stress subscales were highly correlated with the total parenting stress composite.

Table 4

Correlations for Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Chronological Age	-	.11	-.03	.09	.04	.29*	-.03	.16	.22	.22	.22	.18	.28*
2. Gender		-	-.32**	.33**	-.04	.11	-.01	.26*	.24	.31*	.32*	.30*	.03
3.Verbal Ability			-	-.50**	.08	.07	-.08	-.24	-.40**	-.39**	-.38**	-.38**	-.30*
4. Diagnostic Status				-	-.26*	-.13	-.06	.51**	.59**	.64**	.64**	.73**	.39**
5. Parent Education					-	.20	.16	-.07	-.10	-.18	-.15	-.34**	-.23
6. Marital Status						-	.01	-.12	-.17	-.14	-.16	-.03	.10
7. Annual Income							-	-.18	.01	-.14	-.11	-.22	-.05
8. Parental Distress (PD)								-	.71**	.71**	.84**	.61**	.37**
9. Parent-Child Dysfunctional Interaction (PCDI)									-	.88**	.94**	.74**	.45**
10. Difficult Child (DC)										-	.96**	.84**	.37**
11. Parenting Stress Composite											-	.83**	.43**
12. Hyperactivity, PR												-	.52**
13. Hyperactivity, TR													-

Note. $N = 64$. Verbal ability = Verbal Reasoning Cluster Score from DAS-II; Hyperactivity, PR = *T*-scores from BASC-2 Parent Rating Scales; Hyperactivity, PR = *T*-scores from BASC-2 Parent Rating Scales.

*$p < .05$. ** $p < .01$. ***$p < .001$.

Descriptive Analyses

Descriptive statistics including: means, standard deviations, t-tests, and effect sizes for all study variables based on group are presented in Table 5. Significant group differences were found for each of the study variables: the parenting stress composite, Parental Distress (PD) subscale, Parent-Child Dysfunctional Interaction (PCDI) subscale, Difficult Child (DC) subscale, parent reported hyperactivity, and teacher reported hyperactivity. The ASD group had significantly higher scores on both the PSI-4-SF, the measure of parenting stress and BASC-2, the measure of hyperactivity as compared to the typically developing group with very large effect sizes of this difference between groups.

Table 5
Descriptive Statistics for Study Variables by Group

Variable	Means *(SD)* [Range]				
	Total	TD (*n* = 39)	ASD (*n* =25)	*t*	*d*
Parental Distress (PD)	50.39 *(11.26)* [14.00, 83.00]	45.82 *(8.92)* [14.00, 63.00]	57.52 *(10.63)* [36.00, 83.00]	-4.68***	1.19
Parent-Child Dysfunctional Interaction (PCDI)	50.14 *(11.24)* [26.00, 80.00]	44.87 *(7.23)* [36.00, 70.00]	58.36 *(11.28)* [39.00, 80.00]	-5.75***	1.43
Difficult Child (DC)	52.47 *(13.71)* [34.00, 83.00]	45.49 *(8.47)* [34.00, 64.00]	63.36 *(13.01)* [38.00, 83.00]	-6.57***	1.63
Parenting Stress Composite	51.25 *(11.94)* [34.00, 85.00]	45.18 *(7.20)* [34.00, 63.00]	60.72 *(11.51)* [39.00, 85.00]	-6.56***	1.62
Hyperactivity, PR	57.70 *(15.12)* [34.00, 94.00]	49.36 *(8.33)* [34.00, 68.00]	71.28 *(13.30)* [44.00, 94.00]	-7.90***	1.97
Hyperactivity, TR	52.57 *(10.54)* [39.00, 83.00]	49.09 *(8.69)* [39.00, 83.00]	57.04 *(10.81)* [39.00, 79.00]	-3.10**	0.81

Note. $N = 64$. Hyperactivity, TR = *T*-scores from BASC-2 Teacher Rating Scales; Hyperactivity, PR = *T*-scores from BASC-2 Parent Rating Scales.
*$p < .05$. ** $p < .01$. ***$p < .001$.

Test of Hypotheses

Hypothesis 1: Diagnostic status is positively related to parenting stress. In order to examine the relation between diagnostic status and parenting stress levels, I conducted separate

multiple regression analyses for the composite of total stress and then for each of the three subscales of parenting stress. Tests of the four a priori components of this hypothesis were conducted using Bonferroni adjusted alpha levels of .0125 per test (.05/4). First, hierarchical linear regression was used to examine the direct relation between diagnostic status and total parenting stress. Gender, parent education, and verbal ability were correlated with diagnostic status and thus were entered as control variables in the first step. Diagnostic status was entered in the second step and total parenting stress score was entered as the dependent variable. The control variables, gender, parent education, and verbal ability were significant predictors of parenting stress, accounting for 20% of the variance in the model, $F(3, 60) = 5.07$, $p = .003$. Diagnostic status significantly predicted total parenting stress and accounted for an additional 22% of the variance in the model, $\Delta F = 22.88$, $p = .000$, indicating that parents of children with ASD had more overall stress than parents of typically developing children. See Table 6 for regression coefficients.

Table 6
Hierarchical Regression: Parenting Stress Composite Regressed on Diagnostic Status

Variable	*B*	SE *B*	*β*	R^2	*F*	ΔR^2	ΔF
Step 1				.20	5.07**		
Gender	5.44	3.11	.21				
Parent Education	-.83	.83	-.12				
Verbal Ability	-.28	.11	-.31*				
Step 2				.43	10.91***	.22	22.88***
Diagnostic Status	13.99	2.92	.58***				

Note. $N = 64$. Verbal ability = Verbal Reasoning Cluster Score from DAS-II; Diagnostic status (TD = -1, ASD = 1).
*$p < .05$. ** $p < .01$. ***$p < .001$.

Parental distress (PD) subscale. In order to understand whether diagnostic status predicted different types of stress reported by parents, each subscale of the PSI-4-SF was analyzed separately. Diagnostic status significantly predicted parental distress and accounted for 18% of the variance within the model, indicating parents of children with ASD had more distress

associated with personal factors related to parenting such as social support or competence than parents of typically developing children.

Parent-child dysfunctional interaction (PCDI) subscale. Diagnostic status significantly predicted parent-child dysfunctional interactions and accounted for 19% of the variance within the model, indicating parents of children with ASD had more adverse feelings surrounding fulfillment within interactions and meeting of expectations than parents of typically developing children.

Difficult child (DC) subscale. Diagnostic status significantly predicted difficulty of the child and accounted for 22% of the variance within the model, indicating parents of children with ASD had more stress and difficulties associated with emotional and behavioral characteristics of their child than parents of typically developing children. See table 7 for regression weights for each of the three subscales.

Hypothesis 2: Diagnostic status is positively related to hyperactivity. Hierarchical linear regression was used to examine the direct relation between diagnostic status and hyperactivity. First the relation between diagnostic status and teacher reported hyperactivity was examined. Chronological age, gender, parent education, and verbal ability were entered as control variables in the first step, and diagnostic status was entered in the second step. The control variables, chronological age, gender, parent education, and verbal ability were significant predictors of teacher reported hyperactivity, accounting for 22% of the variance in the model, $F(4, 59) = 4.22$, $p = .005$. The contribution of diagnostic status significantly predicted hyperactivity and accounted for an additional 5% of the variance in the model, $\Delta F = 4.36$, $p = .04$. Next the relation between diagnostic status and parent reported hyperactivity was examined.

Table 7
Hierarchical Regression: Parenting Stress Subscales Regressed on Diagnostic Status

Variable	*B*	SE *B*	*β*	R^2	*F*	ΔR^2	ΔF
Dependent variable: Parental Distress (PD)							
Step 1				.10	2.21		
Gender	4.92	3.12	.20				
Parent Education	-.34	.83	-.05				
Verbal Ability	-.15	.11	-.17				
Step 2				.28	5.60***	.18	14.32***
Diagnostic Status	11.72	3.10	.51***				
Dependent variable: Parent-Child Dysfunctional Interaction (PCDI)							
Step 1				.18	4.29**		
Gender	3.11	2.98	.13				
Parent Education	-.44	.79	-.07				
Verbal Ability	-.30	.11	-.35**				
Step 2				.37	8.52***	.19	17.63***
Diagnostic Status	12.14	2.89	.53***				
Dependent variable: Difficult Child (DC)							
Step 1				.21	5.34**		
Gender	5.90	3.56	.20				
Parent Education	-1.18	.95	-.14				
Verbal Ability	-.33	.13	-.32*				
Step 2				.43	10.93***	.22	22.07***
Diagnostic Status	15.77	3.36	.57***				

Note. $N = 64$. Verbal ability = Verbal Reasoning Cluster Score from DAS-II; Diagnostic status (TD = -1, ASD = 1); Hyperactivity, TR = *T*-scores from BASC-2 Teacher Rating Scales; Hyperactivity, PR = *T*-scores from BASC-2 Parent Rating Scales.
*$p < .05$. ** $p < .01$. ***$p < .001$.

Chronological age, gender, parent education, and verbal ability were entered as control variables in the first step, and diagnostic status was entered in the second step. The control variables, chronological age, gender, parent education, and verbal ability were significant predictors of parent reported hyperactivity, accounting for 29% of the variance in the model, $F(4, 59) = 5.93$, $p = .000$. After accounting for control variables, the contribution of diagnostic status significantly predicted hyperactivity and accounted for an additional 24% of the variance in the model, $\Delta F = 30.04$, $p = .000$. This finding indicates that hyperactivity level differed between children with

ASD and typically developing children as reported by both teachers and parents. See Table 8 for regression coefficients.

Table 8
Hierarchical Regression: Hyperactivity Regressed on Diagnostic Status

Variable	*B*	SE *B*	*β*	R^2	*F*	ΔR^2	ΔF
Dependent variable: Hyperactivity, TR							
Step 1				.22	4.22*		
Chronological Age	.22	.09	.32**				
Gender	-1.8	2.83	-.07				
Parent Education	-1.37	.73	-.23*				
Verbal Ability	-.23	.10	-.27*				
Step 2				.28	4.44*	.05	4.36*
Diagnostic Status	5.59	3.07	.29*				
Dependent variable: Hyperactivity, PR							
Step 1				.29	5.93***		
Chronological Age	.18	.12	.16				
Gender	5.79	3.76	.18				
Parent Education	-2.78	1.01	-.32**				
Verbal Ability	-.33	.14	-.27*				
Step 2				..53	13.08***	.24	30.04***
Diagnostic Status	19.04	3.34	.60***				

Note. $N = 64$. Verbal ability = Verbal Reasoning Cluster Score from DAS-II; Diagnostic status (TD = -1, ASD = 1); Hyperactivity, TR = *T*-scores from BASC-2 Teacher Rating Scales; Hyperactivity, PR = *T*-scores from BASC-2 Parent Rating Scales.
*$p < .05$. ** $p < .01$. ***$p < .001$.

Hypothesis 3: Hyperactivity will positively predict amount of parenting stress even after controlling for status. In order to examine the relation between hyperactivity and parenting stress levels, I conducted separate multiple regression analyses for the composite of total stress and if significant, for each of the three subscales of parenting stress. Tests of the four a priori components of this hypothesis were conducted using Bonferroni adjusted alpha levels of .0125 for each test (.05/4). First, hierarchical linear regression was used to examine the direct relation between hyperactivity and total parenting stress. Chronological age, gender, verbal ability, and diagnostic status were entered as control variables in the first step, teacher reported hyperactivity was entered in the second step and total parenting stress score was entered as the

dependent variable. The control variables, chronological age, gender, verbal ability, and diagnostic status were significant predictors of parenting stress, accounting for 45% of the variance in the model, $F(4, 59) = 12.12$, $p = .000$. Teacher report of hyperactivity was not a significant predictor of parenting stress after controlling for the influence of diagnostic status and the other control variables and only accounted for an additional 2.5% of the variance in the model, $\Delta F = 2.71$, $p = .11$. See Table 9 for regression coefficients. Next analyses were run for parent report of hyperactivity. Chronological age, gender, verbal ability, and diagnostic status were entered as control variables in the first step, parent reported hyperactivity was entered in the second step and total parenting stress score was entered as the dependent variable. The control variables, chronological age, gender, verbal ability, and diagnostic status were significant predictors of parenting stress, accounting for 45% of the variance in the model, $F(4, 59) = 12.12$, $p = .000$. Parent reported hyperactivity was a significant positive predictor of parenting stress after controlling for the influence of diagnostic status and the other control variables accounting for an additional 14% of the variance in the model, $\Delta F = 19.79$, $p = .000$. See Table 10 for regression coefficients.

Table 9
Hierarchical Regression: Parenting Stress Composite Regressed on Hyperactivity, TR

Variable	*B*	SE *B*	*β*	R^2	*F*	ΔR^2	ΔF
Step 1				.45	12.12***		
Chronological Age	.14	.09	.16				
Gender	2.25	2.67	.09				
Verbal Ability	-.07	.10	-.07				
Diagnostic Status	13.60	2.76	.56***				
Step 2				.48	10.52***	.03	2.71
Hyperactivity, TR	.22	.13	.18				

Note. $N = 64$. Verbal ability = Verbal Reasoning Cluster Score from DAS-II; Diagnostic status (TD = -1, ASD = 1); Hyperactivity, TR = *T*-scores from BASC-2 Teacher Rating Scales.
*$p < .05$. ** $p < .01$. ***$p < .001$.

Table 10
Hierarchical Regression: Parenting Stress Composite Regressed on Hyperactivity, PR

Variable	*B*	SE *B*	*β*	R^2	*F*	ΔR^2	ΔF
Step 1				.45	12.12***		
Chronological Age	.14	.09	.16				
Gender	2.25	2.67	.09				
Verbal Ability	-.07	.10	-.07				
Diagnostic Status	13.60	2.76	.56***				
Step 2				.59	16.74***	.14	19.79***
Hyperactivity, PR	.48	.11	.53***				

Note. $N = 64$. Verbal ability = Verbal Reasoning Cluster Score from DAS-II; Diagnostic status (TD = -1, ASD = 1); Hyperactivity, PR = *T*-scores from BASC-2 Parent Rating Scales.
*$p < .05$. ** $p < .01$. ***$p < .001$.

Parental distress (PD) subscale. In order to understand whether hyperactivity predicted different types of stress felt by parents, each subscale of the PSI-4-SF was analyzed separately with the significant predictor variable, parent reported hyperactivity. The control variables, gender, verbal ability, diagnostic status, and parent education were significant predictors of parental distress, accounting for 28% of the variance in the model, $F(4, 59) = 5.60$, $p = .001$. After controlling for diagnostic status and the other covariates parent reported hyperactivity did not significantly predict parental distress when adjusting for the Bonferroni correction and only accounted for an additional 7% of the variance within the model, $\Delta F = 5.93$ $p = .018$. See Table 11 for regression weights.

Parent-child dysfunctional interaction (PCDI) subscale. The control variables, gender, verbal ability, diagnostic status, and parent education were significant predictors of parent-child dysfunctional interaction, accounting for 36% of the variance in the model, $F(4, 59) = 8.52$, $p = .000$. Even after controlling for diagnostic status and the other control variables parent reported hyperactivity significantly predicted parent-child dysfunctional interaction accounting for an additional 13% of the variance within the model, $\Delta F = 15.19$, $p = .000$. See Table 11 for regression weights.

Table 11
Hierarchical Regression: Parenting Stress Subscales Regressed on Hyperactivity, PR

Variable	*B*	SE *B*	*β*	R^2	*F*	ΔR^2	ΔF
Dependent variable: Parental Distress (PD)							
Step 1				.28	5.60***		
Gender	2.58	2.89	.11				
Verbal Ability	.03	.11	.04				
Diagnostic Status	5.86	1.55	.51***				
Parent Education	.43	.78	.06				
Step 2				.34	6.04***	.07	5.93*
Hyperactivity, PR	.33	.13	.37*				
Dependent variable: Parent-Child Dysfunctional Interaction (PCDI)							
Step 1				.37	8.52***		
Gender	.68	2.70	.03				
Verbal Ability	-.11	.11	-.13				
Diagnostic Status	6.07	1.45	.53***				
Parent Education	.36	.73	.05				
Step 2				.50	11.49***	.13	15.19***
Hyperactivity, PR	.44	.11	.52***				
Dependent variable: Difficult Child (DC)							
Step 1				.43	10.93***		
Gender	2.75	3.13	.09				
Verbal Ability	-.08	.12	-.08				
Diagnostic Status	7.89	1.68	.57***				
Parent Education	-.14	.84	-.02				
Step 2				.64	20.76***	.22	34.95***
Hyperactivity, PR	.67	.11	.67***				

Note. $N = 64$. Verbal ability = Verbal Reasoning Cluster Score from DAS-II; Diagnostic status (TD = -1, ASD = 1); Hyperactivity, PR = *T*-scores from BASC-2 Parent Rating Scales.
*$p < .05$. ** $p < .01$. ***$p < .001$.

Difficult child (DC) subscale. The control variables, gender, verbal ability, diagnostic status, and parent education were significant predictors of difficult child, accounting for 43% of the variance in the model, $F(4, 59) = 10.93$, $p = .000$. Even after controlling for diagnostic status and the other control variables parent reported hyperactivity significantly predicted parent-child dysfunctional interaction accounting for an additional 22% of the variance within the model, $\Delta F = 34.94$, $p = .000$. See table 11 for regression weights.

Hypothesis 4*:* Hyperactivity will moderate the relation between child diagnostic status and total parenting stress. Hierarchical linear regression was utilized to test the hypothesis that diagnostic status would predict parenting stress as moderated by teacher report of hyperactivity. In step one, chronological age, gender, and verbal ability were entered as control variables. Diagnostic status and centered teacher reported hyperactivity were entered in step two. Finally, the cross product of diagnostic status and centered hyperactivity were entered in the final step with the parenting stress composite set as the dependent variable. Results from the regression analysis indicated that the control variables, chronological age, gender, and verbal ability were significant predictors of parenting stress, accounting for 23% of the variance in the model, $F(3,60) = 5.83$, $p = .001$. Diagnostic status and hyperactivity significantly predicted parenting stress after controlling for the influence of chronological age, gender, and verbal ability accounting for an additional 25% of the variance within the model, $\Delta F = 13.82$, $p = .000$. The interaction term between diagnostic status and hyperactivity was not significant and accounted for no additional variance within the model, $\Delta F = 0.00$, $p = .552$. See Table 12 for regression weights.

Table 12
Hierarchical Regression Analysis for the Moderating Effects of Hyperactivity, TR on the Relationship Between Diagnostic Status and Parenting Stress Composite

Variable	*B*	SE *B*	*β*	R^2	*F*	ΔR^2	ΔF
Step 1				.23	5.83***		
Chronological Age	.17	.10	.19				
Gender	4.93	3.08	.19				
Verbal Ability	-.29	.11	-.32*				
Step 2				.48	10.52***	.25	13.82***
Diagnostic Status	6.08	1.42	.50***				
Hyperactivity	.22	.13	.18				
Step 3				.48	8.73***	.00	.36
Diagnostic Status x Hyperactivity	.09	.12	.06				

Note. $N = 64$. Verbal ability = Verbal Reasoning Cluster Score from DAS-II; Diagnostic status (TD = -1, ASD = 1); Hyperactivity, TR = *T*-scores from BASC-2 Teacher Rating Scales.
*$p < .05$. ** $p < .01$. ***$p < .001$.

Next the moderation analysis was examined with parent reported hyperactivity. Hierarchical linear regression was utilized to test the hypothesis that diagnostic status would predict parenting stress as moderated by parent report of hyperactivity. In step one, gender, verbal ability, and parent education were entered as control variables. Diagnostic status and centered parent reported hyperactivity were entered in step two. Finally, the cross product of diagnostic status and centered hyperactivity were entered in the final step with the parenting stress composite set as the dependent variable. Results from the regression analysis indicated that the control variables, gender, verbal ability, and parent education were significant predictors of parenting stress, accounting for 21% of the variance in the model, $F(3,60) = 5.34$, $p = .003$. Diagnostic status and parent reported hyperactivity significantly predicted parenting stress after controlling for the influence of gender, verbal ability, and parent education accounting for an additional 43% of the variance within the model, $\Delta F = 34.86$, $p = .000$. The interaction term between diagnostic status and parent reported hyperactivity was not significant and accounted for no additional variance within the model, $\Delta F = 0.06$, $p = .798$. See Table 13 for regression weights.

Table 13
Hierarchical Regression Analysis for the Moderating Effects of Hyperactivity, PR on the Relationship Between Diagnostic Status and Parenting Stress Composite

Variable	*B*	SE *B*	*β*	R^2	*F*	ΔR^2	ΔF
Step 1				.21	5.34**		
Gender	5.90	3.56	.20				
Verbal Ability	-.33	.13	-.32*				
Parent Education	-1.18	.95	-.14				
Step 2				.64	20.76***	.43	34.86***
Diagnostic Status	1.42	1.74	.16				
Hyperactivity	.67	.11	.67***				
Step 3				.64	17.03***	.00	.06
Diagnostic Status x Hyperactivity	.08	.12	.02				

Note. $N = 64$. Verbal ability = Verbal Reasoning Cluster Score from DAS-II; Diagnostic status (TD = -1, ASD = 1); Hyperactivity, PR = *T*-scores from BASC-2 Parent Rating Scales.
*$p < .05$. ** $p < .01$. ***$p < .001$.

In addition to differences in parenting stress within groups based on child hyperactivity, I hypothesized that child hyperactivity would differentially affect parenting stress between groups. To examine this effect I conducted multiple regression analysis examining the influence of parent reported hyperactivity on parenting stress for the ASD group and TD group separately. For typically developing children, gender, verbal ability, and parent education were entered on step 1 and parent reported hyperactivity was entered on step 2. Gender, verbal ability, and parent education were not significant predictors of parental distress, accounting for only 13% of the variance in the model, $F(3,35) = 1.79$, $p = .17$. After controlling for covariates, parent reported hyperactivity was a significant predictor of parenting stress accounting for an additional 23% of the variance within the model, $\Delta F = 12.00$, $p = .001$. See Table 14 for regression weights. For children with ASD, gender, verbal ability, and parent education were not significantly predictive of parenting stress accounting for only 2% of the variance in the model, $F(3,21) = .13$, $p = .94$. After controlling for covariates, parent reported hyperactivity was a significant predictor of parenting stress accounting for an additional 29% of the variance within the model, $\Delta F = 8.28$, $p = .009$. See Table 15 for regression weights.

Table 14
Hierarchical Regression: Parenting Stress Composite Regressed on Hyperactivity for TD Group

Variable	*B*	SE *B*	*β*	R^2	*F*	ΔR^2	ΔF
Step 1				.13	1.79		
Gender	4.16	2.30	.29				
Verbal Ability	-.12	.10	-.19				
Parent Education	-.14	.69	-.03				
Step 2				.36	4.77**	.23	12.00***
Hyperactivity, PR	.47	.14	.55***				

Note. $n = 39$. Verbal ability = Verbal Reasoning Cluster Score from DAS-II; Hyperactivity, PR = *T*-scores from BASC-2 Parent Rating Scales.
*$p < .05$. ** $p < .01$. ***$p < .001$.

Table 15
Hierarchical Regression: Parenting Stress Composite Regressed on Hyperactivity for ASD Group

Variable	*B*	SE *B*	*β*	R^2	*F*	ΔR^2	ΔF
Step 1				.02	.13		
Gender	-3.79	8.49	-.11				
Verbal Ability	-.02	.24	-.01				
Parent Education	.86	1.66	.12				
Step 2				.31	2.20	.29	8.28**
Hyperactivity, PR	.58	.18	.58**				

Note. n = 25. Verbal ability = Verbal Reasoning Cluster Score from DAS-II; Hyperactivity, PR = *T*-scores from BASC-2 Parent Rating Scales.
*p < .05. ** p < .01. ***p < .001.

Hypothesis 5: Hyperactivity will increase stress in each of the three parent stress domains, parental distress (PD), parent-child dysfunctional interaction (PCDI), and difficult child (DC) in addition to the overall increase in the composite of parenting stress for parents of children with ASD. Given research suggesting that child characteristics (i.e. child hyperactivity) may independently influence parenting stress based on the characteristics of the parent and other situational life stressors (e.g. Abidin, 1995), I examined the effects of each type of parenting stress for the ASD group and TD group separately. I conducted multiple regression analysis examining the influence of parent reported hyperactivity on parental distress (PD), parent-child dysfunctional interaction (PCDI), and difficult child (DC) for each group. Parent reported hyperactivity was the only aspect of child hyperactivity that was examined because it was the best predictor of total stress and each of the subscales parenting stress.

Parental distress (PD) subscale. For typically developing children, gender, verbal ability, and parent education were entered on step 1 and parent reported hyperactivity was entered on step 2. Gender, verbal ability, and parent education were not significant predictors of parental distress, accounting for only 3% of the variance in the model, $F(3,35) = .39$, $p = .77$. After controlling for covariates, parent reported hyperactivity showed a trend towards significantly predicting parental distress accounting for an additional 10% of the variance within the model,

ΔF = 3.94, p = .055. See Table 16 for regression weights. For children with ASD, gender, verbal ability, and parent education were not significantly predictive of parental distress accounting for only 12% of the variance in the model, $F(3,21) = .97$, p = .42. Hyperactivity was not a significant predictor of parental distress and accounted for only an additional 10% variance in the model, ΔF = 2.74, p = .114. See Table 17 for regression weights.

Parent-child dysfunctional interaction (PCDI) subscale. For typically developing children, gender, verbal ability, and parent education were entered on step 1 and parent reported hyperactivity was entered on step 2. Gender, verbal ability, and parent education were not significant predictors of parent-child dysfunctional interaction, accounting for only 8% of the variance in the model, $F(3,35) = 1.07$, p = .37. After controlling for covariates, parent reported hyperactivity was a significant predictor of parent-child dysfunctional interaction accounting for an additional 14% of the variance within the model, ΔF = 6.01, p = .02. See Table 16 for regression weights. For children with ASD, gender, verbal ability, and parent education were not significantly predictive of parent-child dysfunctional interaction accounting for only 3% of the variance in the model, $F(3,21) = .20$, p = .90. After controlling for covariates, parent reported hyperactivity was a significant predictor of parent-child dysfunctional interaction accounting for an additional 23% of the variance within the model, ΔF = 6.12, p = .022. See Table 17 for regression weights.

Difficult child (DC) subscale. For typically developing children, gender, verbal ability, and parent education were entered on step 1 and parent reported hyperactivity was entered on step 2. Gender, verbal ability, and parent education were not significant predictors of parental distress, accounting for 18% of the variance in the model, $F(3,35) = 2.48$, p = .08. After controlling for covariates, parent reported hyperactivity was a significant predictor of difficult

child accounting for an additional 22% of the variance within the model, $\Delta F = 12.40$, $p = .001$. See Table 16 for regression weights. For children with ASD, gender, verbal ability, and parent education were not significantly predictive of the difficult child subscale accounting for only 3% of the variance in the model, $F(3,21) = .20$, $p = .90$. After controlling for covariates, parent reported hyperactivity was a significant predictor of the difficult child subscale accounting for an additional 38% of the variance within the model, $\Delta F = 12.61$, $p = .002$. See Table 17 for regression weights.

Table 16
Hierarchical Regression: Parenting Stress Subscales Regressed on Hyperactivity for TD Group

Variable	*B*	SE *B*	*β*	R^2	*F*	ΔR^2	ΔF
Dependent variable: Parental Distress (PD)							
Step 1				.03	.39		
Gender	2.50	3.01	.14				
Verbal Ability	-.03	.13	-.03				
Parent Education	-.55	.91	-.10				
Step 2				.13	1.30	.10	3.94
Hyperactivity	.39	.20	.37				
Dependent variable: Parent-Child Dysfunctional Interaction (PCDI)							
Step 1				.08	1.07		
Gender	2.20	2.37	.15				
Verbal Ability	-.13	.11	-.20				
Parent Education	.55	.72	.12				
Step 2				.22	2.42	.14	6.01*
Hyperactivity	.37	.15	.43*				
Dependent variable: Difficult Child (DC)							
Step 1				.18	2.48		
Gender	5.30	2.63	.31				
Verbal Ability	-.19	.12	-.25				
Parent Education	.16	.80	.03				
Step 2				.40	5.56**	.22	12.40***
Hyperactivity	.55	.16	.54***				

Note. $n = 39$. Verbal ability = Verbal Reasoning Cluster Score from DAS-II; Hyperactivity, PR = *T*-scores from BASC-2 Parent Rating Scales.
*$p < .05$. ** $p < .01$. ***$p < .001$.

Table 17
Hierarchical Regression: Parenting Stress Subscales Regressed on Hyperactivity for ASD Group

Variable	*B*	SE *B*	*β*	R^2	*F*	ΔR^2	ΔF
Dependent variable: Parental Distress (PD)							
Step 1				.12	.97		
Gender	1.28	7.42	.04				
Verbal Ability	.13	.21	.14				
Parent Education	2.27	1.45	.33				
Step 2				.23	1.47	.11	2.74
Hyperactivity	.35	.18	.35				
Dependent variable: Parent-Child Dysfunctional Interaction (PCDI)							
Step 1				.03	.20		
Gender	-5.32	8.28	-.15				
Verbal Ability	-.14	.23	-.14				
Parent Education	.33	1.62	.05				
Step 2				.26	1.71	.23	6.12*
Hyperactivity	.51	.18	.52*				
Dependent variable: Difficult Child (DC)							
Step 1				.03	.19		
Gender	-6.46	9.56	-.16				
Verbal Ability	-.01	.27	-.01				
Parent Education	-.12	1.86	-.01				
Step 2				.40	3.37*	.38	12.61**
Hyperactivity	.72	.19	.66*				

Note. $n = 25$. Verbal ability = Verbal Reasoning Cluster Score from DAS-II; Hyperactivity, PR = *T*-scores from BASC-2 Parent Rating Scales.
*$p < .05$. ** $p < .01$. ***$p < .001$.

Post-hoc analyses

Mediation: The indirect effect of diagnostic status on parenting stress through hyperactivity. Given the finding that diagnostic status was significantly related to parenting stress as well as hyperactivity, I sought to examine the process that underlies the observed relationship between diagnostic status and parenting stress by assessing hyperactivity as a mediator variable.

To test whether parent reported hyperactivity mediated the relation between diagnostic status and parenting stress, I conducted a multiple regression analysis using a macro command, PROCESS, to test mediation models that includes covariates (Hayes, 2013). PROCESS is a macro command used through SPSS to examine path-analysis that estimates direct and indirect

(Hayes, 2013). In step 1 of the mediation model, the direct path of diagnostic status on parenting stress, ignoring the mediator, was significant, $\beta = 6.99$, $t(59) = 4.78$, $p = .000$. Step 2 showed that the regression testing the influence of the diagnostic status on the mediator, hyperactivity, was also significant, $\beta = 9.45$ $t(59) = 5.57$, $p = .000$. Step 3 of the mediation process showed that the mediator (hyperactivity), controlling for diagnostic status, was significant, $\beta = .46$, $t(58) = 4.86$, $p = .000$. Step 4 of the analyses revealed that, controlling for the mediator (hyperactivity), diagnostic status was not a significant predictor of parenting stress, $\beta = 2.61$, $t(58) = 1.70$, $p = .09$. A Sobel test was conducted and found partial mediation in the model ($z = 3.63$, $p = .000$). It was found that hyperactivity partially mediated the relation between diagnostic status and parenting stress, as shown in Figure 2. See Table 18 for regression weights.

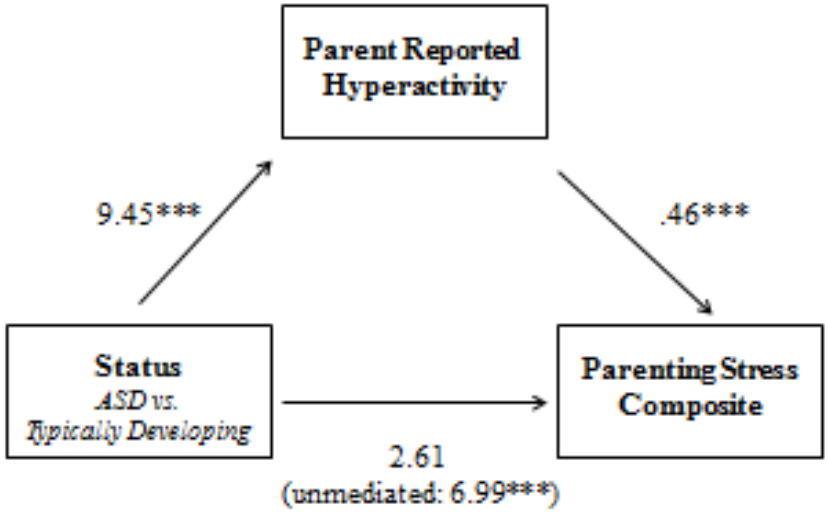

Figure 2. Indirect Effect of Diagnostic Status on Parenting Stress through Hyperactivity.
* $p < .05$, ** $p < .01$, *** $p < .001$

Table 18

Regression Results for the Relation of Diagnostic Status to Parenting Stress as Mediated by Hyperactivity

	Mediator Variable Model			
Predictor	*B*	*SE*	*t*	*p*
Constant	67.86	14.43	4.70	.00
Diagnostic Status	9.45	1.70	5.58	.00
Gender (covariate)	2.47	3.17	.78	.44
Verbal Ability (covariate)	-.02	.12	-.14	.89
Parent Education (covariate)	-1.63	.85	-1.91	.06
	Dependent Variable Model			
Predictor	*B*	*SE*	*t*	*p*
Constant	25.56	12.38	2.06	.04
Hyperactivity, PR	.46	.10	4.87	.00
Diagnostic Status	2.61	1.53	1.70	.09
Gender (covariate)	1.50	2.33	.64	.52
Verbal Ability (covariate)	-.05	.09	-.59	.56
Parent Education (covariate)	.84	.64	1.31	.20

Indirect Effect of Diagnostic Status on Parenting Stress						
	Effect	*SE*	LL 95% CI	UL 95% CI	*z*	*p*
Sobel	4.38	1.58	1.69	7.98	3.63	.000

Note. $N = 64$. Verbal ability = Verbal Reasoning Cluster Score from DAS-II; Diagnostic status (TD = -1, ASD = 1); Hyperactivity, PR = *T*-scores from BASC-2 Parent Rating Scales; CI = 95% confidence interval for indirect effect, if CI does not include zero indirect effect is considered statistically significant.

*$p < .05$. ** $p < .01$. ***$p < .001$.

CHAPTER IV:

Discussion

This study investigated the relation between hyperactivity and parenting stress in children with and without ASD and their parents. I sought to establish the association between these variables and to specify if this relation differed based on children's diagnostic status. The sample consisted of 25 children with ASD and 39 typically developing children between the ages of 3 years, 0 months and 6 years, 11 months. My primary hypothesis involved a moderation model whereby hyperactivity would moderate the relation between diagnostic status and parenting stress levels. Furthermore, I expected the strength of this relation to be stronger for children with ASD across all types of parenting stress. In the following sections, I discuss results from analyses of my hypotheses and post-hoc analyses. Following this I discuss the strengths and limitations of this study, the implications of results, and provide suggestions for future research.

Interpretation of Results

Diagnostic status predicting parenting stress. The hypothesis that diagnostic status (ASD versus typically developing) would predict parenting stress levels was supported. Group differences were found for each of the subscales: parental distress (PD), parent-child dysfunctional interaction (PCDI), and difficult child (DC), as well as the parenting stress composite. Parents of children with ASD reported significantly more total stress than parents of typically developing children. This finding is consistent with previous research that found parents of children with ASD had higher stress than parents of typically developing children (Estes et al., 2009; Estes et al., 2013; Hayes & Watson, 2013; Sanders & Morgan, 1997; Smith et al. 2001).

Diagnostic status predicting hyperactivity. The hypothesis that diagnostic status (ASD versus typically developing) would predict severity of child hyperactivity was supported.

Research has demonstrated that children with ASD score significantly higher across measures of externalization and often present with "comorbid" ADHD symptoms, which includes hyperactivity (Leyfer et al., 2006; Mahan & Matson, 2011). Diagnostic status was found to predict hyperactivity based on both teacher report and parent report. Specifically, teachers and parents of children with ASD reported higher hyperactive behaviors than parents and teachers of TD children. Even after controlling for chronological age, gender, parent education, and verbal ability, which were strongly correlated with hyperactivity, diagnostic status still predicted teacher and parent reports of hyperactive behaviors. This finding indicates that hyperactivity differs between children with ASD and typically developing children with rated by both parents and teachers.

Hyperactivity predicting parenting stress. The hypothesis that hyperactivity would predict total parenting stress levels was partially supported. Teacher reported hyperactivity did not significantly predict parenting stress levels, however parent reported hyperactivity did significantly predict parenting stress levels. This finding indicates that children who exhibit more hyperactive behavior have parents with higher stress levels. This is consistent with the overarching research documenting that childhood externalization is associated with increased parenting stress in typically developing children and children with ASD from 2- to 9-years old (e.g. Crnic et al., 2005; Davis & Carter, 2008; Dumas et al., 1991; Estes et al., 2009; Lecavalier et al., 2006). Due to the age range of my sample, it is likely that children on the lower half of the range (ages 3 years 0 months to 4 years 11 months) had not been in a school setting for a significant proportion of time thus decreasing the ability for teachers to provide an accurate reflection of the child's hyperactivity. Researchers also suggest that parents of children with disabilities who experience high levels of parenting stress tend to associate their stress levels

with their child's problem behaviors above and beyond what could be accounted for by the child's developmental delay alone (Baker et al., 2003). Therefore, it could be that hyperactivity observed and experienced directly by parents in the home setting is more strongly related to parenting stress.

Moderation analyses. Children's hyperactivity was examined as a moderator of the relation between diagnostic status and parenting stress. Particularly, I expected that the strength of this relation would be higher for children with ASD as compared to typically developing children. Full support for the hypothesized moderation model was not found with teacher or parent report of hyperactivity as the moderator. Within both the teacher and parent report models, a direct relation between diagnostic status and parenting stress was found however the interaction of these two variables did not predict parenting stress. This suggests that for both groups, ASD and TD, the effects of hyperactivity on parenting stress were similar.

Analyses examined whether parenting stress levels differed based on child hyperactivity for each group separately. For the TD group, parent reported hyperactivity significantly predicted total parenting stress, difficulties within the parent-child interaction and difficulties associated with the child. For the ASD group, parent reported hyperactivity significantly predicted total parenting stress, difficulties within the parent-child interaction and difficulties associated with the child. However, parental distress was not significantly associated with hyperactivity for either the TD or ASD groups. Specifically, it was found that increased hyperactivity within both the TD and ASD groups was associated with significant increases in parenting stress regarding their child and their relationship to their child. These associations appeared very similar for both groups.

Post-hoc mediation analyses. Although the hypothesized moderation model was not significant, the significant relations found for individual steps in the model with parent report of hyperactivity suggested that an alternative mediation model might exist. Specifically, the direct relation between diagnostic status and parenting stress and the differences between groups levels of parenting stress based on parent reported hyperactivity suggest that hyperactivity may be a mechanism through which diagnostic status influences parenting stress.

My post-hoc analysis supported this alternate model. Results revealed that parent reported hyperactivity mediated the relation between diagnostic status and parenting stress. This finding provides further insight into the mechanisms by which diagnostic status may convey vulnerability for parenting stress. Specifically, the data suggests that one way parenting stress levels can be explained by their child's diagnosis is through children's level of hyperactivity. Results suggest a strong positive association between hyperactivity and parenting stress for both children who are typically developing and children with ASD. These findings make novel contributions to the limited literature examining behavioral problems in young children with ASD and the associated difficulties these problems present for parents. Researchers suggest that the relation between child externalizing behavior problems and parenting stress may be bi-directional (Baker et al., 2003; Davis & Carter, 2008; Lecavalier, Leone, & Wiltz, 2006). Thus, there is evidence suggesting that child behavior problems may elevate parenting stress levels and externalizing behaviors exhibited by children may occur in response to parental stress (Baker & Heller, 1996; Patterson, 1982). Given the high levels of hyperactivity seen in children with ASD, these findings may be most useful when designing interventions for children with ASD and their parents. Furthermore, these findings suggest that high levels of hyperactivity in young children with ASD may make parents more vulnerable to increased levels of parenting stress.

Clinical Implications

The results of my study have several important clinical implications for families with typically developing children and for families with children with ASD. It has been well documented that typically developing children often display externalizing behaviors (Eisenberg et al., 2003a, 2003b; Hinshaw, 1992). In addition, researchers have documented that young children with ASD often have a high frequency of externalizing behavior problems, including hyperactivity (Hanson et al., 2013), which has been linked to significant negative outcomes during the school age period and throughout the lifespan (Cicchetti, 1989; Widom, 1989). Specifically, the results of the current study suggest adverse familial outcomes for parents of children with associated hyperactivity. Research documents evidence suggesting a bi-directional relation between externalizing behaviors exhibited by children and parenting stress levels (Baker et al., 2003; Davis & Carter, 2008). Children with ASD had higher parent and teacher reported hyperactivity and higher levels of parenting stress across all parenting stress domains (i.e. parental distress, parent-child dysfunctional interaction, and difficult child) when compared to parents of typically developing children with high reports of hyperactivity. Due to the high reports of hyperactivity in my sample, parents of children with ASD who experience higher levels of stress may engage in less self-care, including habitual lack of sleep, particularly of note for parents of children with developmental disabilities (Gallagher et al., 2010). These findings highlight the importance of parent-child interventions aimed at decreasing the difficulties associated with raising a child with elevated hyperactivity which may reduce total parenting stress levels by targeting both the child and parent. Research has documented that early intervention and support for family members has been linked to decreased child behavioral

problems, increased parental competence, and increased responsiveness within the parent-child relationship (Bailey et al, 2005; Guarlnick, 2011; Markowitz, 2004).

My study findings also highlight the importance of considering the role of child characteristics (e.g., chronological age, gender, verbal abilities, and hyperactivity) in addition to an ASD diagnosis when examining parenting stress levels and implementing family interventions. Researchers have suggested that parenting is influenced by characteristics of the parent, the child, and their interaction with others and their environment (Belsky, 1984; Bronfenbrenner & Morris, 2006). Thus, it seems likely that clinicians designing interventions for children with ASD and high levels of hyperactivity need to consider providing additional supports for parents of these children. In addition, it would be important for clinicians to target the symptoms of hyperactivity regardless of diagnosis as my study suggests an increased need for behavioral interventions for parents with children who are typically developing but have high levels of hyperactivity. Therefore parent-child interventions targeting behavioral symptoms of the child and modifying the role of the parent through increased guidance from the clinician may help alleviate some of the difficulties faced within the parent-child dyad when a child with hyperactivity is present.

It was found in the current study that parents of children with high levels of hyperactivity experienced significantly more stress in their role as a parent regardless of the child's diagnostic status. This is an important finding as parents with typically developing children with hyperactivity are likely to have similar struggles with their sense of parenting competence, stresses associated with restrictions in their life, lack of social support and depression as parents of children with ASD. In addition, parents of children with high levels of hyperactivity may also experience more disappointment with their child, feelings of rejection or alienation by/from the

child, or have difficulty bonding with the child regardless of the child's diagnosis. Clinicians should properly assess the functioning of the child through comprehensive diagnostic assessment and of the parents by utilizing clinical interviews and questionnaires, as these feelings can result in a lack of warmth or initiation of interactions with the child by the parent (Abidin, 2012). Furthermore, parents of children with high levels of hyperactivity may have significantly more difficulties with their child in the areas of behavior and emotion regulation.

Lastly, it is interesting to note that the association between hyperactivity and parenting stress levels was similar for parents with typically developing children and parents of children with ASD. This is very clinically relevant as many children without a diagnosis and their parents are often overlooked in terms of services provided. Interventions should address the overarching symptoms of hyperactivity affecting these families.

Strengths and Limitations

This study had several strengths as well as limitations. An important strength of this study was its adequate sample size (n = 64) of young children. In addition, there were several methodological strengths, including the use of a typically developing control sample, and the use of multiple reporters regarding the children's hyperactivity (i.e., teacher and parent). Another prominent strength of this study was its extension of existing research in the field of autism and externalizing behaviors. Although several previous studies have examined elevated parenting stress levels as well as high rates of externalizing behaviors problems in children with ASD, no research has considered the associations among these constructs or focused solely on the behavior problem of hyperactivity. Therefore, this study aids in linking previous bodies of research.

While this study had a number of strengths, several limitations need to be noted. For example, the group distributions were not equally disbursed with the ASD group being significantly smaller (n = 25) than the typically developing group (n = 39). This might have affected my ability to detect significant effects present in the general population particularly differences between groups. Additionally, this study examined hyperactivity and parenting stress using a cross-sectional design. Consequently, results from my study do not facilitate an understanding of the influence of hyperactivity on parenting stress over time for children with ASD or typical development. One additional limitation of my study was the relatively homogeneous sample with regard to ethnicity, marital status, and salary. My participants were predominately Caucasian (73.4%), married (96.9%) and upper-middle class (mean annual income = $132,384) and, therefore, may not have accurately represented the general population. In addition, the majority of parents that participated in the study with their child were mothers (86%). Greater variability in ethnicity, marital status, income, or parent gender may have resulted in different findings regarding parent report of hyperactive behaviors, parent stress levels or the relations between these variables. Furthermore, children in the ASD group did not receive additional diagnostic confirmation through the use of a standardized assessment in our laboratory setting beyond the reports obtained from providers. Also, given the minimum verbal abilities requirement of one standard deviation below the mean, it is likely that the ASD sample represented a higher functioning sample of children with ASD than found in the greater population.

Future Research

Given the important clinical implications of the study concerning the need for interventions for families of children with hyperactivity, future research is needed to support and

extend the results of the present study in order to more fully understand these associations. In particular, future studies should utilize larger samples with greater heterogeneity in age, verbal abilities, and socio-economic backgrounds to allow for greater generalizability of the current study's findings. Increasing variability in children's characteristics such as including children with a broader range of ASD characteristics as well as expanding upon hyperactivity to examine all externalizing behaviors may allow more interventions to be developed to target a greater proportion of the population.

Another principal consideration for future research is the use of a longitudinal design to examine how hyperactivity is related to parenting stress level over time for children with and without ASD. Due to the cross-sectional design of my current study, I was unable to draw causal conclusions regarding relations between the constructs. It is important that future longitudinal studies continue to examine this relation, particularly among preschool and early childhood to delineate the growth of these behaviors and discern the long-term outcomes in an effort to continue creating effective familial interventions.

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